Honeywell

ST 800
SmartLine Pressure Transmitters
User's Manual

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About This Manual

This manual is a detailed *how to* reference for installing, piping, wiring, configuring, starting up, operating, maintaining, calibrating, and servicing Honeywell's family of ST 800 SmartLine Pressure Transmitters. Users who have a Honeywell ST 800 SmartLine Pressure Transmitter configured for HART protocol or Honeywell's Digitally Enhanced (DE) are referred to the *ST 800 Series HART/DE Option User's Manual*, document number 34-ST-25-38. Users who have a Honeywell ST 800 SmartLine Pressure Transmitter configured for Fieldbus operation are referred to the *ST 800 Series Fieldbus Option User's Manual*, document number (34-ST-25-39).

The configuration of your Transmitter depends on the mode of operation and the options selected for it with respect to operating controls, displays and mechanical installation. This manual provides detailed procedures to assist first-time users, and it further includes keystroke summaries, where appropriate, as quick reference or refreshers for experienced personnel.

To digitally integrate a Transmitter with one of the following systems:

- For the Experion PKS, you will need to supplement the information in this document with the data and procedures in the *Experion Knowledge Builder.*
- For Honeywell's TotalPlant Solutions (TPS), you will need to supplement the information in this document with the data in the *PM/APM SmartLine Transmitter Integration Manual*, which is supplied with the TDC 3000 book set. (TPS is the evolution of the TDC 3000).

Release Information:

ST 800 SmartLine Pressure Transmitter User Manual, Document # 34-ST-25-35,
Rev. 1, October, 2012 – First Release

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Rev. 3, February 2013 – Parts list updates

Rev. 4, May 2013 – Updates to Parts list, Explosionproof Seal class, Fail Safe and Comms Module procedures.

Rev. 5, July 2013 – Control Drawing updated to Rev.D

References

The following list identifies publications that may contain information relevant to the information in this document.

ST 800 Smart Pressure Transmitter Quick Start Installation Guide, Document # 34-ST-25-36

ST 800 & ST 700 Smart Pressure Transmitter with HART Communications Options Safety Manual, # 34-ST-25-37

ST 800 SmartLine Pressure Transmitter HART/DE Option User's Manual, Document # 34-ST-25-38

ST 800 FF Transmitter with FOUNDATION Fieldbus Option Installation & Device Reference Guide, Document # 34-ST-25-39

MC Tookit User Manual, for 400 or later, Document # 34-ST-25-20

PM/APM Smartline Transmitter Integration Manual, Document # PM 12-410

ST 800 Series Pressure, Analog, HART and DE Communications form, Honeywell drawing 50049892

Smart Field Communicator Model STS 103 Operating Guide, Document # 34-ST-11-14

Patent Notice

The Honeywell ST 800 SmartLine Pressure Transmitter family is covered by one or more of the following U. S. Patents: 5,485,753; 5,811,690; 6,041,659; 6,055,633; 7,786,878; 8,073,098; and other patents pending.

Support and Contact Information

For Europe, Asia Pacific, North and South America contact details, refer to the back page of this manual or the appropriate Honeywell Solution Support web site:

Honeywell Corporate	www.honeywellprocess.com
Honeywell Process Solutions	www.honeywellprocess.com/pressue-transmitters/
Training Classes	http://www.automationccollege.com

Telephone and Email Contacts

Area	Organization	Phone Number
United States and Canada	Honeywell Inc.	1-800-343-0228 Customer Service 1-800-423-9883 Global Technical Support
Global Email Support	Honeywell Process Solutions	ask-ssc@honeywell.com

Symbol Descriptions and Definitions

The symbols identified and defined in the following table may appear in this document.

Symbol	Definition
	ATTENTION: Identifies information that requires special consideration.
	TIP: Identifies advice or hints for the user, often in terms of performing a task.
CAUTION	**Indicates a situation which, if not avoided, may result in equipment or work (data) on the system being damaged or lost, or may result in the inability to properly operate the process.**
	CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. **CAUTION symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.**
	WARNING: Indicates a potentially hazardous situation, which, if not avoided, could result in serious injury or death. **WARNING symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.**
	WARNING, Risk of electrical shock: Potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 VDC may be accessible.
	ESD HAZARD: Danger of an electro-static discharge to which equipment may be sensitive. Observe precautions for handling electrostatic sensitive devices.
	Protective Earth (PE) terminal: Provided for connection of the protective earth (green or green/yellow) supply system conductor.
	Functional earth terminal: Used for non-safety purposes such as noise immunity improvement. NOTE: This connection shall be bonded to Protective Earth at the source of supply in accordance with national local electrical code requirements.
	Earth Ground: Functional earth connection. NOTE: This connection shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.
	Chassis Ground: Identifies a connection to the chassis or frame of the equipment shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.
continued	

Symbol	Description
	The Factory Mutual® Approval mark means the equipment has been rigorously tested and certified to be reliable.
	The Canadian Standards mark means the equipment has been tested and meets applicable standards for safety and/or performance.
	The Ex mark means the equipment complies with the requirements of the European standards that are harmonised with the 94/9/EC Directive (ATEX Directive, named after the French "ATmosphere EXplosible").

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1 Introduction

1.1 Overview

This section is an introduction to the physical and functional characteristics Honeywell's family of ST 800 SmartLine Pressure Transmitters.

1.2 Features and Options

The ST 800 SmartLine Pressure Transmitter is available in a variety of models for measuring Differential Pressure (DP), Gauge Pressure (GP), and Absolute Pressure (AP). Table 1 lists the protocols, human interface (HMI), materials, approvals, and mounting bracket options for the ST 800.

Table 1 – Features and Options

Feature/Option	Standard/Available Options
Communication Protocols	HART version 7, Digitally Enhanced (DE), Fieldbus
Human-Machine Interface (HMI) Options (Basic and Advanced Display)	Basic and Advanced Digital Display
	Three-button programming (optional)
	Basic display language: English only
	Advanced display languages: English, German, French, Spanish, and Russian
Calibration	Single
Approvals (See Appendix C for details.)	ATEX, CSA, FM, IECx, NEPSI
Mounting Brackets	Angle/flat carbon steel/304 stainless steel, Marine 304 stainless steel
Integration Tools	Experion

1.2.1 Physical Characteristics

As shown in Figure 1, the ST 800 is packaged in two major assemblies: the Electronics Housing and the Meter Body. The elements in the Electronic Housing respond to setup commands and execute the software and protocol for the different pressure measurement types. Figure 2 shows the assemblies in the Electronics Housing with available options.

The Meter Body provides connection to a process system. Several physical interface configurations are available, as determined by the mounting and mechanical connections, all of which are described in the "Installation" section of this manual.

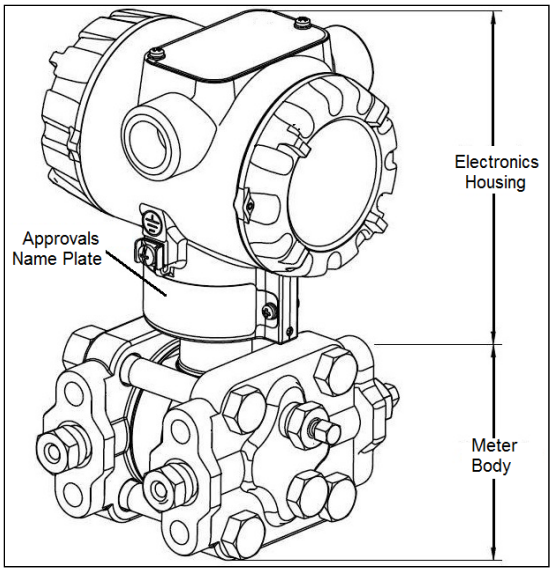

Figure 1 – ST 800 Major Assemblies

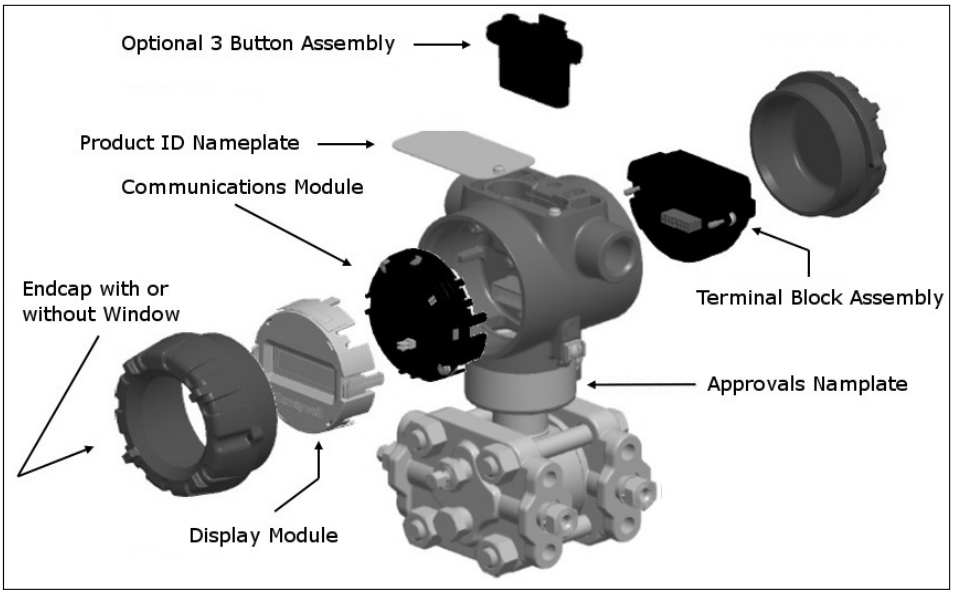

Figure 2 – Electronics Housing Components

1.2.2 Functional Characteristics

Functionally, the Transmitter can measure process pressure and provides a proportional analog 4 to 20 mA output to the measured process variable (PV). Available output communication protocols include Honeywell Digitally Enhanced (DE), HART, and FOUNDATION Fieldbus.

An optional 3-button assembly is available to set up and make adjustments to the Transmitter. In addition, a Honeywell Multi-Communication (MC) Toolkit (not supplied with the Transmitter) can facilitate setup and adjustment procedures. Certain adjustments can be made through an Experion Station or a Universal Station if the Transmitter is digitally integrated with Honeywell's Experion or TPS/TDC 3000 control system.

1.3 ST 800 Transmitter Name Plate

The Transmitter nameplate mounted on the bottom of the electronics housing (see Figure 1) lists its model number, physical configuration, electronics options, accessories, certifications, and manufacturing specialties. Figure 3 is an example of a typical Gauge Pressure (GP) or Atmospheric Pressure (AP) Transmitter name plate. The model number format consists of a Key Number with several table selections. The Differential Pressure (DP), Absolute Pressure (AP), and Gauge Pressure (GP) name plates are essentially the same. However, the DP provides one additional entry (7 vs. 6) in the Meter Body Selections (Table I) to accommodate the static pressure rating.

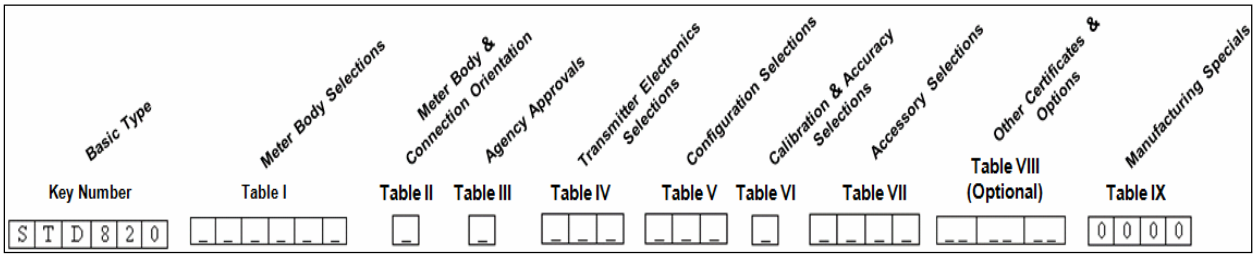

Figure 3 –Typical ST 800 Name Plate

You can readily identify the series and basic Transmitter type from the third and fourth digits in the key number. The letter in the third digit represents one of these basic transmitter types:

- A = Absolute Pressure
- D = Differential Pressure
- F = Flange Mounted
- G = Gauge Pressure
- R = Remote Seals

For a complete selection breakdown, refer to the appropriate Specification and Model Selection Guide provided as a separate document.

1.4 Safety Certification Information

An “approvals” name plate is located on the bottom of the Electronics Assembly; see Figure 1 for exact location. The approvals name plate contains information and service marks that disclose the Transmitter compliance information. Refer to Appendix C of this document for safety certification requirements and details.

1.5 Transmitter Adjustments

Zero and Span adjustments are possible in ST 800 SmartLine Pressure Transmitters with the optional three-button assembly located at the top of the Electronic Housing (see Figure 2).

You can also use the Honeywell MC Toolkit or other third-party hand-held zero to make any adjustments to an ST 800 SmartLine Pressure Transmitter. Alternately, certain adjustments can be made through the Experion or Universal Station, if the Transmitter is digitally integrated with a Honeywell Experion or TPS system.

1.6 Display Options

The ST 800 SmartLine Pressure Transmitter has two display options: Basic and Advanced; see Table 2.

Table 2 – Available Display Characteristics

Basic Display	• Suitable for basic process needs • 360° rotation in 90° Increments • 2 lines, 16 characters • Standard units-of-measurement: Pa, KPa, MPa, KGcm2, TORR, ATM, inH2O, mH2O, bar, mbar, inHg, FTH2O, mmH2O, MMHG, & PSI • Diagnostic messaging • Square root output indications
Advanced Display	• 360° rotation in 90° increments • Three (3) configurable screen formats with configurable rotation timing o Large process variable (PV) o PV with bar graph o PV with trend (1-24 hours, configurable) • Eight (8) screens with 3-30 seconds rotation timing • Standard and custom engineering units • Diagnostic alerts and diagnostic messaging • Multiple language support: o EN, FR, GE, SP, RU o EN, CH (Kanji), IT (future release) • Square root output indication • Supports 3-button configuration and calibration • Supports transmitter messaging, and maintenance mode indications

1.7 Optional 3-Button Assembly

The optional 3-Button Assembly provides the following features and capabilities:

- Increment, decrement, and enter key functions.
- With the menu-driven display:
  - Comprehensive on-screen menu for navigation.
  - Transmitter configuration.
  - Transmitter calibration
  - Display configuration.
  - Set zero and span parameters.

2 Application Design

2.1 Overview

This section discusses the considerations involved with deploying a Honeywell ST 800 SmartLine Pressure Transmitter in a process system. The following areas are covered:

- Safety
- Input and output data
- Reliability
- Environmental limits
- Installation considerations
- Operation and maintenance\
- Repair and replacement

2.2 Safety

2.2.1 Accuracy

The ST 800 SmartLine Pressure Transmitter (Transmitter) measures the gauge, differential, or absolute pressure of a process and reports the measurement to a receiving device. Measurements are accurate up to 0.0375 of the calibrated span.

2.2.2 Diagnostic Messages

Transmitter standard diagnostics are reported in the two basic categories listed in Table 3. Problems detected as critical diagnostics drive the analog output to the programmed burnout level. Problems detected as non-critical diagnostics may affect performance without driving the analog output to the programmed burnout level. Informational messages (not listed in Table 3) report various Transmitter status or setting conditions. The messages listed in Table 3 are specific to the Transmitter, exclusive of those associated with HART and DE protocols. HART and DE diagnostic messages are listed and described in the *ST 800 SmartLine Pressure Transmitter HART/DE Option User Manual*, document number 34-ST-25-38.

Table 3 – ST 800 Standard Diagnostics Messages

Critical Diagnostics (Failure Conditions)	Non-Critical Diagnostics (Warning Conditions)	
Sensor Comm Timeout Meter Body Critical Failure Electronic Module Diag Failure Config Data Corrupt Meter Body NVM Corrupt Electronic Module DAC Failure	No DAC Compensation No Factory Calibration PV Out of Range Fixed Current Mode Sensor Over Temperature Meter Body Excess Correct No DAC Compensation No Factory Calibration Local Display Low Supply Voltage	No DAC Calibration Tamper Alarm Meter Body Unreliable Comm Loop Current Noise AO Out of Range URV Set Error – Span Config Button LRV Set Error – Span Config Button

2.2.3 Safety Integrity Level (SIL)

The ST800 is intended to achieve sufficient integrity against systematic errors by the manufacturer's design. A Safety Instrumented Function (SIF) designed with this product must not be used at a SIL level higher than the statement, without "prior use" justification by the end user or diverse technology redundancy in the design. Refer to the *ST 800 & ST 700 Safety Manual*, 34-ST-25-37, for additional information.

3 Installation and Startup

3.1 Installation Site Evaluation

Evaluate the site selected for the ST 800 Transmitter installation with respect to the process system design specifications and Honeywell's published performance characteristics for your particular model. Some parameters that you may want to include in your site evaluation are:

- Environmental Conditions:
  - Ambient Temperature
  - Relative Humidity
- Potential Noise Sources:
  - Radio Frequency Interference (RFI)
  - Electromagnetic Interference (EMI)
- Vibration Sources
  - Pumps
  - Motorized System Devices (e.g., pumps)
  - Valve Cavitation
- Process Parameters
  - Temperature
  - Maximum Pressure Rating

3.2 Honeywell MC Toolkit

In preparation for post-installation processes, refer to the *MC Tookit User Manual,* Document # 34-ST-25-20, for battery conditioning and device operation and maintenance information.

3.3 Display Installation Precautions

Temperature extremes can affect display quality. The display can become unreadable at temperature extremes; however, this is only a temporary condition. The display will again be readable when temperatures return to within operable limits.

The display update rate may increase at cold temperature extremes, but as with readability, normal updating resumes when temperatures are within limits for full operability.

3.4 Mounting ST 800 SmartLine Pressure Transmitters

3.4.1 Summary

Transmitter models, except flush mounts and those with integral flanges, can be attached to a two-inch (50 millimeter) vertical or horizontal pipe using Honeywell's optional angle or flat mounting bracket; alternately you can use your own bracket. Flush-mount models are attached directly to a process pipe or tank by a one-inch weld nipple. Models with integral flanges are supported by the flange connection.

Figure 4 shows typical bracket-mounted and flange-mounted transmitter installations.

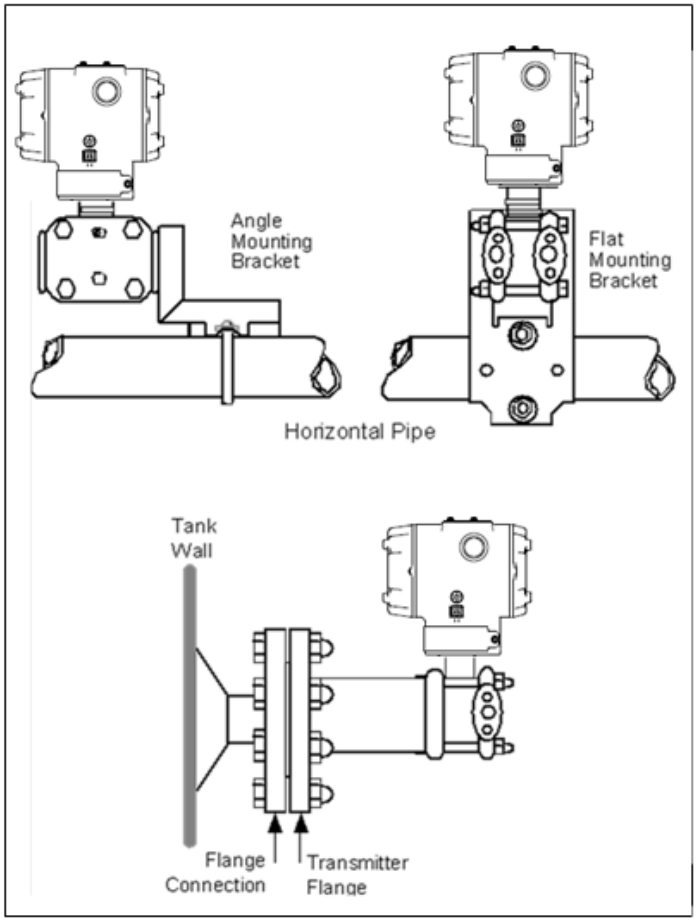

Figure 4 – Typical Bracket Mounted and Flange Mounted Installations

3.4.2 Mounting Dimensions

Refer to Honeywell drawing number 50049930 (Dual Head), 50049931 (In-Line), 50049932 (Flange Mount) 50049933 (Extended Flange), and 50049934 (Remote Seal) for detailed dimensions. Abbreviated overall dimensions are also shown on the Specification Sheets for the transmitter models. This section assumes that the mounting dimensions have already been taken into account and the mounting area can accommodate the Transmitter.

3.4.3 Bracket Mounting Procedure

If you are using an optional bracket, start with Step 1. For an existing bracket, start with Step 2.

1. Refer to Figure 5. Position the bracket on a 2-inch (50.8 mm) horizontal or vertical pipe, and install a "U" bolt around the pipe and through the holes in the bracket. Secure the bracket with the nuts and lock washers provided.

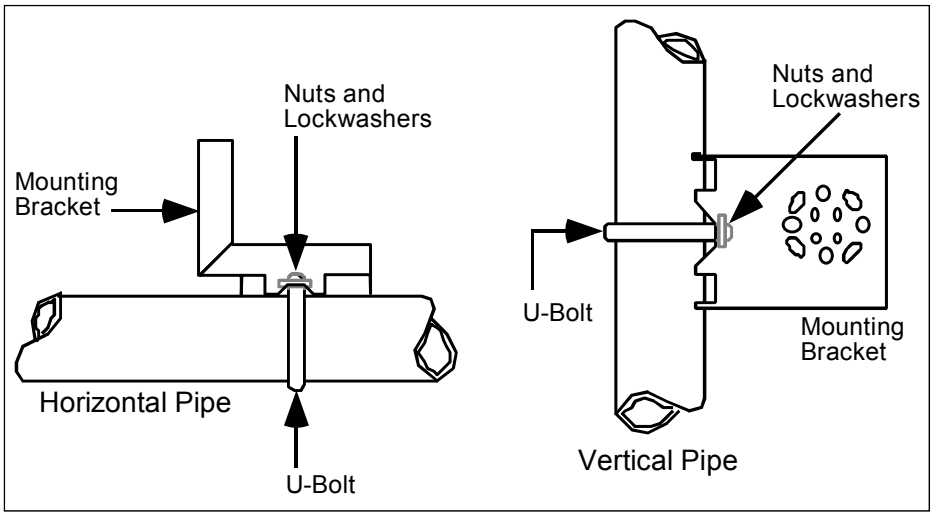

Figure 5 – Angle Mounting Bracket Secured to a Horizontal or Vertical Pipe

2. Align the appropriate mounting holes in the Transmitter with the holes in the bracket. Use the bolts and washers provided to secure the Transmitter to the bracket; see the following variations.

Transmitter Type	Use Hardware
DP with double-ended process heads and/or remote seals	Alternate mounting holes in the ends of the heads
In-line GP and AP (STGxxL and STAxxL)	The smaller "U" bolt provided to attach the meter body to the bracket. See the following example.
Dual-head GP and AP	Mounting holes in the end of the process head.

EXAMPLE: Inline model mounted to an optional angle bracket. See Figure 6**.**

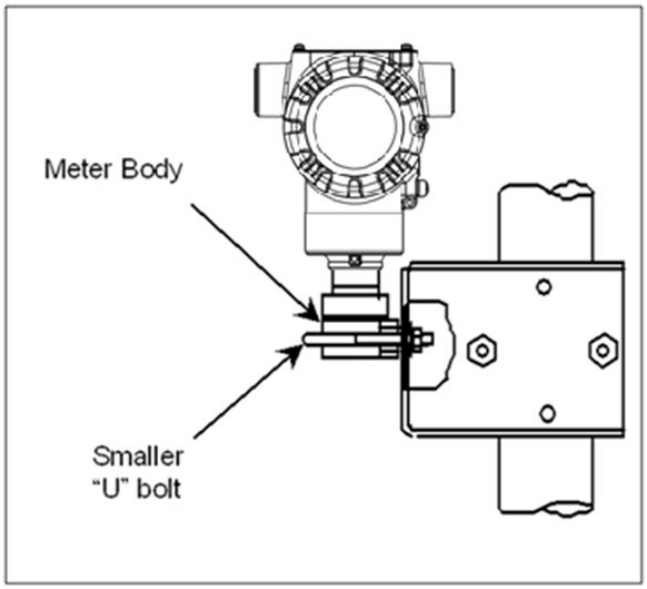

Figure 6 – Inline Model Mounted to an Optional Bracket

3. Loosen the set screw on the outside neck of the Transmitter one (1) full turn.

4. Rotate the Electronics housing a maximum of 180° left or right from the center to the position you require, and tighten the set screw 8.9 to 9.7 pound-inches (1.40 to 1.68 Newton meters), using a 4mm metric socket head wrench. See the following example and Figure 7.

   EXAMPLE: Rotating the Electronics Housing

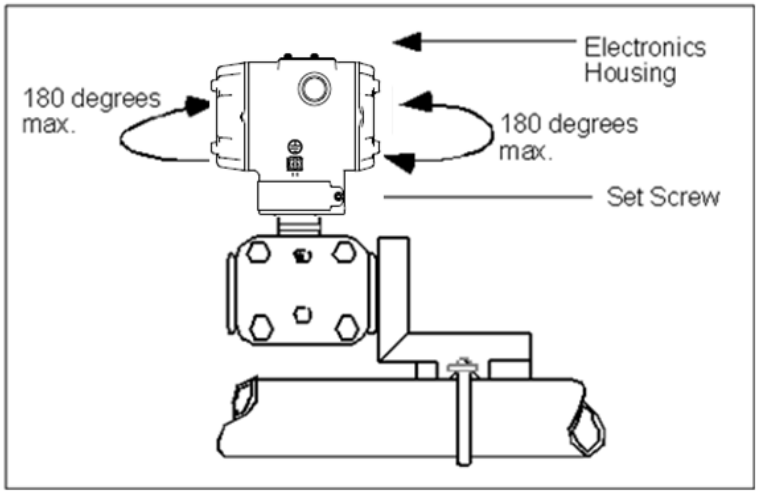

Figure 7 – Rotating the Electronics Housing

The mounting position of absolute pressure models STA822, STA82L, or a draft range model STD810 is critical as the Transmitter spans become smaller.
A maximum zero shift of 2.5 mmHg for an Absolute Transmitter or 1.5 inches of water (inH_2O) for a Draft Range Transmitter can result from a mounting position that is rotated 90° from the vertical. A typical zero-shift of 0.12 mmHg or 0.20 inH_2O can occur for a five (5)-degree rotation from the vertical.

3.4.4 Mounting Transmitters with Small Absolute or Differential Pressure Spans

To minimize positional effects on calibration (zero shift), take the appropriate mounting precautions for the respective Transmitter model. For a model STA822 or STA82L, ensure that the Transmitter is vertical when mounting it. You do this by leveling the Transmitter side-to-side and front-to-back. Figure 8 shows how to level a Transmitter using a spirit level.

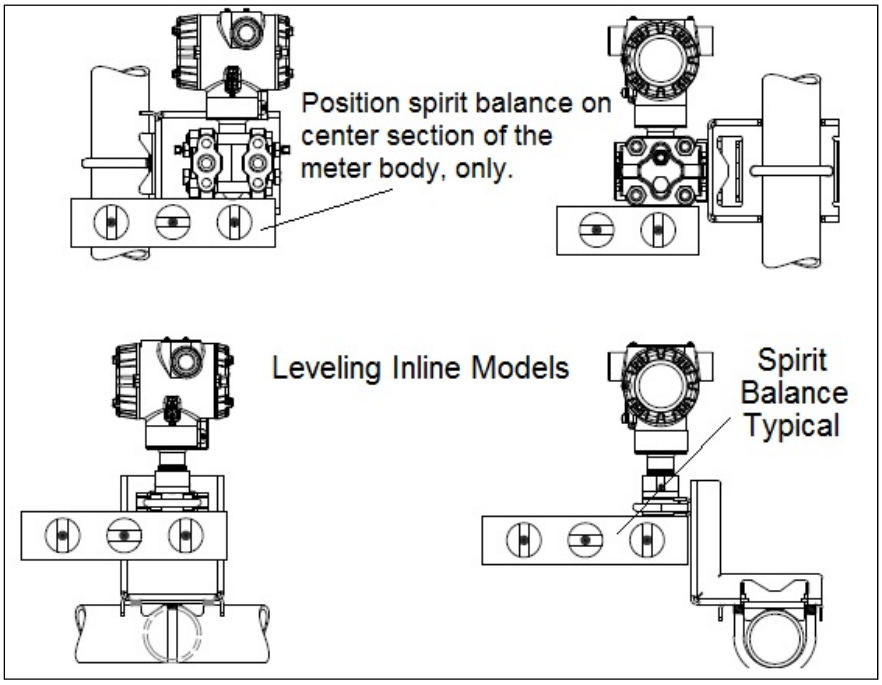

Figure 8 – Using a Spirit Balance to Level a Transmitter

3.4.5 Flange Mounting

Figure 9 shows a typical tank-flange mount installation, with the Transmitter flange mounted to the pipe on the wall of the tank.

On insulated tanks, remove enough insulaiton to accommodate the flange extension.

When flange-mounting to a tank, note the following:

- The End User is responsible for providing a flange gasket and mounting hardware suitable for the Transmitter service conditions.
- To avoid degrading performance in flush-mounted flanged Transmitters, exercise care to ensure that the internal diameter of the flange gasket does not obstruct the sensing diaphragm.
- To prevent performance degradation in extended-mount flanged Transmitters, ensure that sufficient clearance exists in front of the sensing diaphragm body.

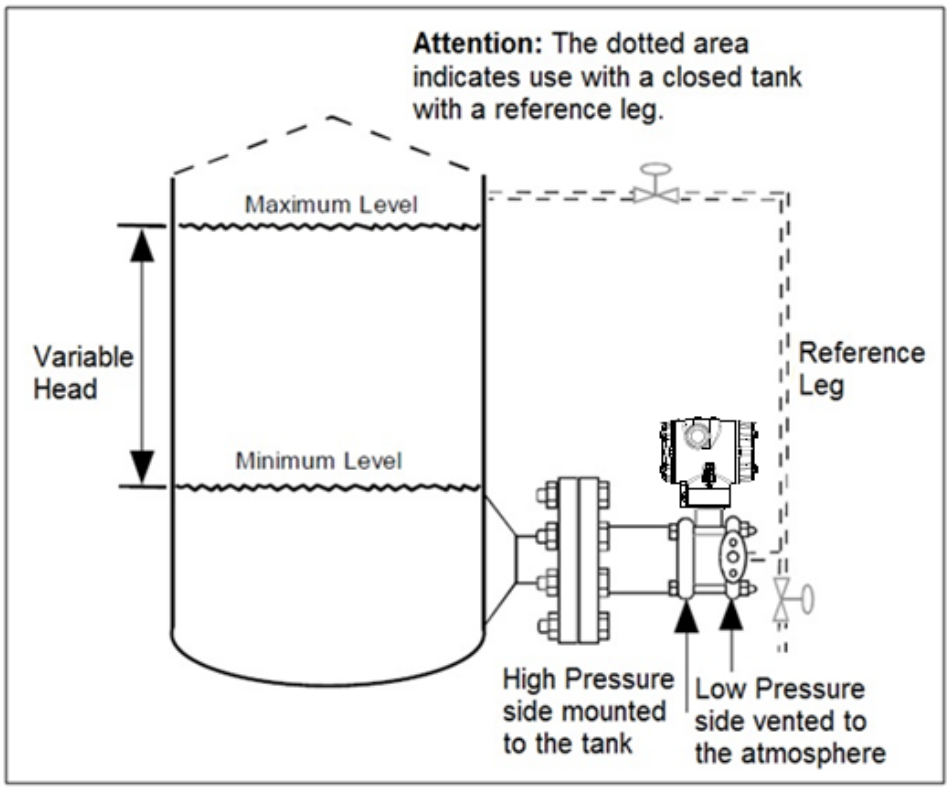

Figure 9 – Tank-Flange Mounted Transmitter

3.4.6 Flush Mounting Procedure

After the Transmitter is mounted, the Electronics Housing can be rotated to the desired position. For insulated tanks, remove enough insulation to accommodate the mounting sleeve and/or the flange extension.

Mount the Transmitter flanges within the limits Table 4 for the fill fluid in the capillary tubes, with a tank at one (1) atmosphere.

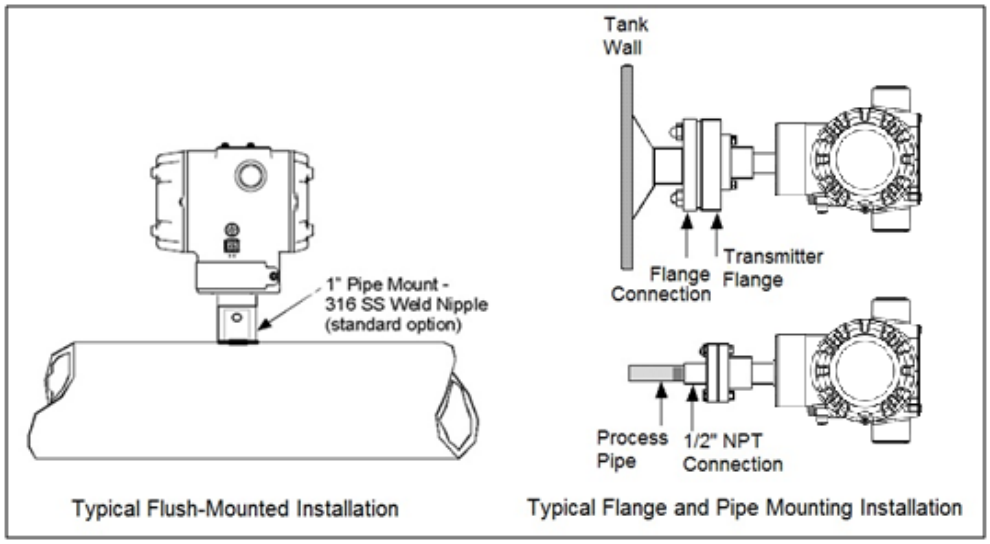

Figure 10 – Typical Flush and Flange Mounted Installations

1. Refer to Figure 10 for a representative flush-mounted Transmitter installation. Cut a hole for a one (1) inch standard pipe in the tank or pipe at the Transmitter mounting site.
2. Weld the 1-inch mounting sleeve to the tank wall or to the hole you cut in the pipe.
3. Insert the Transmitter Meter Body into the mounting sleeve, and secure it with the locking bolt.
4. Tighten the bolt to a torque of 4 Nm $\pm$0.3 Nm (4.7 pound-feet $\pm$0.2 pound-feet).

3.4.7 Remote Diaphragm Seal Mounting Information

The combination of tank vacuum and high pressure capillary head effect should not exceed nine (9) psi (300 mmHg) absolute. For insulated tanks, be sure to remove enough insulation to accommodate the flange extension. The end user is responsible for supplying a flange gasket and mounting hardware suitable for the service condition of the Transmitter.

Mount the Transmitter flanges within the limits in for the fill fluid in the capillary tubes, with a tank at one (1) atmosphere.

Table 4 – Flange Mounting Guidelines

Fill Fluid	Mount the Flange…
Silicone 200 Oil	≤22 feet (6.7 meters) below the Transmitter
Chlorotrifluorethylene (CTFE)	≤11 feet (3.4 meters) below the Transmitter

Refer to Figure 11 for a representative remote diaphragm seal installation. Mount the Transmitter at a remote distance determined by the length of the capillary tubing.

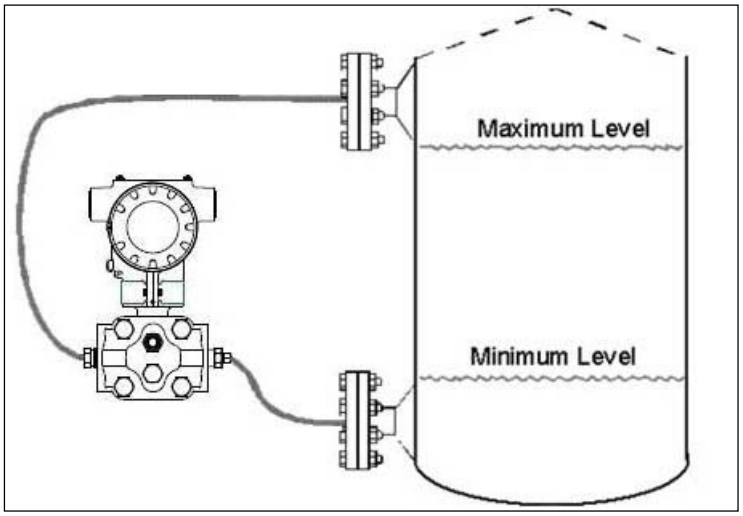

Figure 11 – Representative Remote Diaphragm Seal Transmitter Installation

Depending on Transmitter model, connect the remote seal to the tank according to Table 5.

Table 5 – Remote Diaphragm Mounting Details

Transmitter Model	Connect the Remote Seal on ….	
	Variable Head	Fixed or Constant Head
STR82D	Transmitter High Pressure (HP) Side to tank wall lower flange mounting.	Transmitter Low Pressure (LP) side to tank wall upper flange.
STR83D	Transmitter Low Pressure (LP) Side to tank wall lower flange mounting.	Transmitter Low Pressure (LP) side to tank wall upper flange. **OR** High Pressure (HP) side to tank wall upper flange

3.5 Piping the ST 800 Transmitter

3.5.1 Piping Arrangements

Piping arrangements vary depending upon process measurement requirements and the Transmitter model. For example, a differential pressure transmitter comes with double-ended process heads with ¼-inch NPT connections, which can be modified to accept ½-inch NPT through optional flange adapters. Gauge pressure transmitters are available with various connections for direct mounting to a process pipe.

A ½-inch, schedule 80, steel pipe is commonly used for Transmitter integration into a process system. Many piping arrangements use a three-valve manifold to connect the process piping to the Transmitter. A manifold makes it easy to install and remove or re-zero a Transmitter without interrupting the process. A manifold also accommodates the installation of blow-down valves to clear debris from pressure lines. Figure 12 represents a typical piping arrangement using a three-valve manifold and blow-down lines for a differential pressure transmitter being used to measure flow.

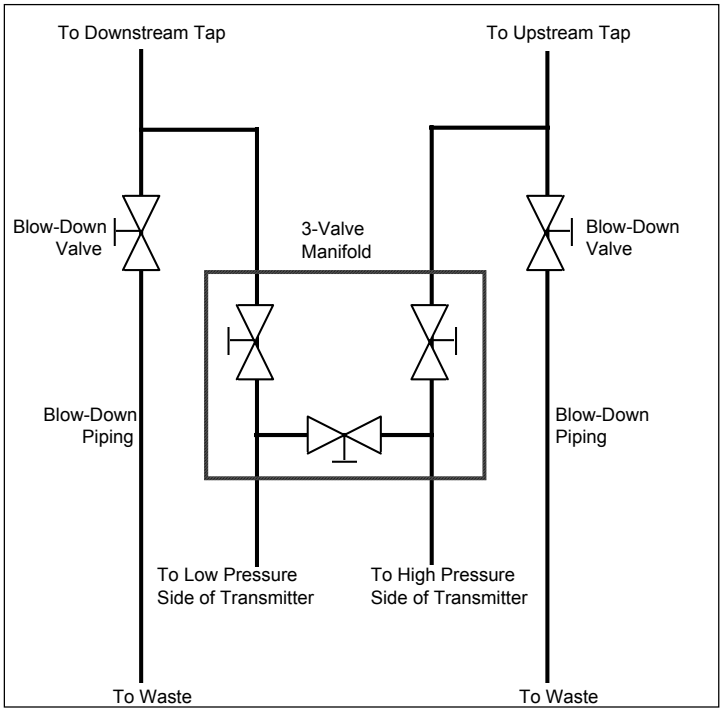

Figure 12 – Typical 3-Valve Manifold with Blow-Down Piping

3.5.2 Suggestions for Transmitter Location

Suggests connections based on what is being processed by the system.

Table 6 – Suggested Connection Locations

Process	Suggested Location	Description
Gases	Above the gas line.	The condensate drains away from the Transmitter.
Liquids	Below but near the elevation of the process connection.	This minimizes that static head effect of the condensate.
	Level with or above the process connection.	This requires a siphon to protect. the Transmitter from process steam. The siphon retains water as a *fill fluid*.

1. For liquid or steam, the piping should slope a minimum of 25.4 mm (1 inch) per 305 mm (1 foot).
2. Slope the piping down toward the Transmitter if it is below the process connection to allow the bubbles to rise back into the piping through the liquid.
3. If the transmitter is located above the process connection, the piping should rise vertically above the Transmitter. In this case, slope down toward the flow line with a vent valve at the high point.
4. For gas measurement, use a condensate leg and drain at the low point (freeze protection may be required here).

3.5.3 General Piping Guidelines

- When measuring fluids that contain suspended solids, install permanent valves at regular intervals to blow-down piping.
- Blow-down all lines on new installations with compressed air or steam, and flush them with process fluids (where possible) before connecting these lines to the Transmitter Meter Body.
- Verify that the valves in the blow-down lines are closed tightly after the initial blow-down procedure and each maintenance procedure thereafter.

3.5.4 Procedure to Install Flange Adapters

The following procedure provides the steps for removing and replacing an optional flange adapter on the process head.

This procedure does not require that the Meter Body be removed from the Electronics Housing. If flange adapters are being replaced with parts from other kits (for example, process heads), follow the procedures for the kits and incorporate the following procedure.

NOTE: The threaded hole in each Flange Adapter is offset from center. To ensure proper orientation for re-assembly, note the orientation of the offset relative to each Process Head **before removing any adapter.**

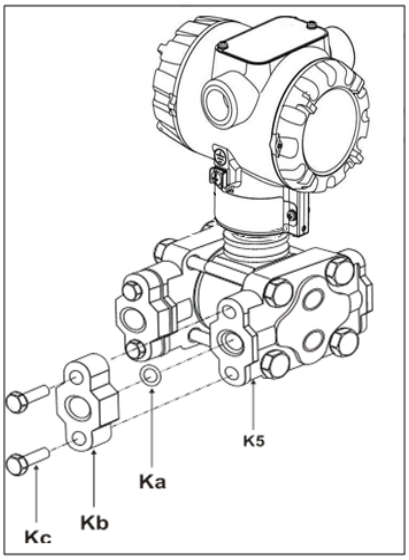

Figure 13 – Flange Adapter Removal and Replacement

Refer to the instructions included with the kit for removal and replacement procedures.

3.6 Wiring a Transmitter

3.6.1 Overview

The transmitter is designed to operate in a two-wire power/current loop with loop resistance and power supply voltage within the operating range shown in Figure 14.

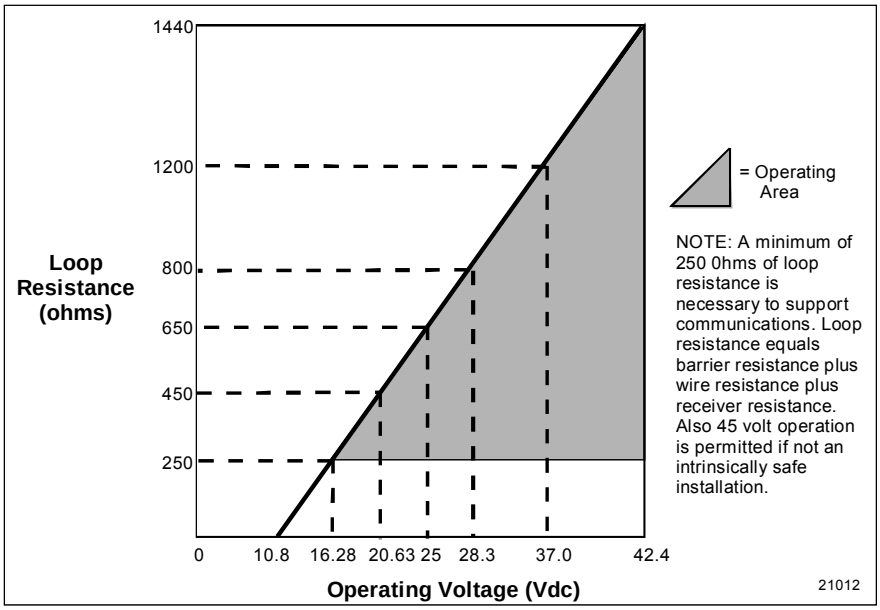

Figure 14 – Transmitter Operating Ranges

Loop wiring is connected to the Transmitter by simply attaching the positive (+) and negative (–) loop wires to the positive (+) and negative (–) terminals on the Transmitter terminal block in the Electronics Housing shown in Figure 15.

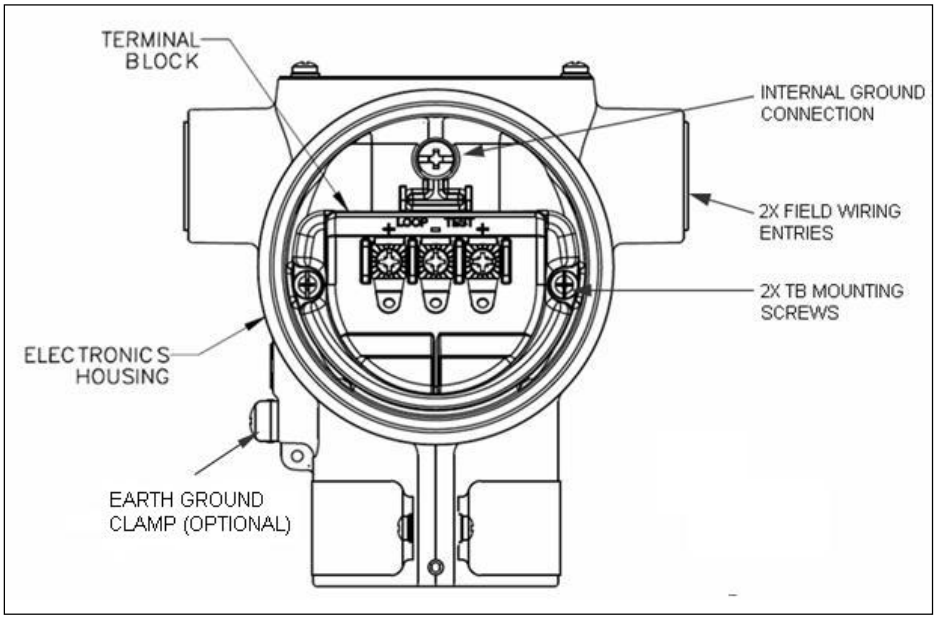

Figure 15 – Transmitter 3-Screw Terminal Board and Grounding Screw

As shown in Figure 15, each Transmitter has an internal terminal to connect it to earth ground. Optionally, a ground terminal can be added to the outside of the Electronics Housing. While it is not necessary to ground the Transmitter for proper operation, doing so tends to minimize the possible effects of noise on the output signal and affords protection against lightning and static discharge. An optional lightning terminal block can be installed in place of the non-lightning terminal block for Transmitters that will be installed in an area that is highly susceptible to lightning strikes.

Wiring must comply with local codes, regulations and ordinances. Grounding may be required to meet various approval body certification, for example CE conformity. Refer to Appendix A of this document for details.

Note: The right hand terminal is for loop test and not applicable for Fieldbus option.

The Transmitter is designed to operate in a two-wire power/current loop with loop resistance and power supply voltage within the operating range; see Figure 14. With optional lightning protection and/or a remote meter, the voltage drop for these options must be added to the basic 10.8-volt supply requirements to determine the required Transmitter voltage (V_{XMTR}) and maximum loop resistance ($R_{LOOP\ MAX}$). Additional consideration is required when selecting intrinsic safety barriers to ensure that they will supply at least minimum Transmitter voltage ($V_{XMTR\ MIN}$), including the required 250 ohms of resistance (typically within the barriers) needed for digital communications.

Transmitter loop parameters are as follows:
$R_{LOOP\ MAX}$ = maximum loop resistance (barriers plus wiring) that will allow proper Transmitter operation and is calculated as $R_{LOOP\ MAX} = (V_{SUPPLY\ MIN} - V_{XMTR\ MIN}) \div 21.8$ mA.

In this calculation:

$V_{XMTR\ MIN} = 10.8\ V + V_{LP} + V_{SM}$
$V_{LP} = 1.1$ V, lightning protection option, LP
$V_{SM} = 2.3$ V, remote meter

Note that V_{SM} should only be considered if a remote meter will be connected to the transmitter.

The positive and negative loop wires are connected to the positive (+) and negative (–) terminals on the terminal block in the Transmitter Electronics Housing.

Barriers can be installed per Honeywell's instructions for Transmitters to be used in intrinsically safe applications.

3.6.2 Digital System Integration Information

Transmitters that are to be digitally integrated to Honeywell's Total Plant Solution (TPS) system will be connected to the Pressure Transmitter Interface Module in the Process Manager, Advanced Process Manager or High Performance Process Manager through a Field Termination Assembly. Details about the TPS system connections are given in the *PM/APM SmartLine Transmitter Integration Manual*, PM12-410, which is part of the TDC 3000^X system bookset.

If you are digitally integrating a Transmitter in an Allen Bradley Programmable Logic Controller (PLC) process system, the same Field Terminal Assembly (FTA) and wiring procedures used with Honeywell's TPS system are also used with the Allen-Bradley 1771 and 1746 platforms.

3.6.3 Wiring Variations

The above procedures are used to connect power to a Transmitter. For loop wiring and external wiring, detailed drawings are provided for Transmitter installation in non-intrinsically safe areas and for intrinsically safe loops in hazardous area locations.
If you are using the Transmitter with Honeywell's TPS system, see *PM/APM Smartline Transmitter Integration Manual*, PM12-410, which is part of the TDC 3000^X system bookset.

3.6.4 Wiring Procedure

1. See Figure 15, above, for parts locations. Loosen the end cap lock using a 1.5 mm Allen wrench.
2. Remove the end cap cover from the terminal block end of the Electronics Housing.
3. Feed loop power leads through one end of the conduit entrances on either side of the Electronics Housing. The Transmitter accepts up to 16 AWG wire.
4. Plug the unused conduit entrance with a conduit plug appropriate for the environment.
5. Connect the positive loop power lead to the positive (+) terminal and the negative loop power lead to the negative (-) terminal. Note that the Transmitter is not polarity-sensitive.
6. Replace the end cap, and secure it in place.

3.6.5 Lightning Protection

If your Transmitter includes the optional lightning protection, connect a wire from the Earth Ground Clamp (see Figure 15) to Earth Ground to make the protection effective. Use a size 8 AWG or ($8.37mm^2$) bare or green covered wire for this connection.

3.6.6 Supply Voltage Limiting Requirements

If your Transmitter complies with the ATEX 4 directive for self-declared approval per 94/9EC, the power supply has to include a voltage-limiting device. Voltage must be limited such that it does not exceed 42 V DC. Consult the process design system documentation for specifics.

3.6.7 Process Sealing

The ST 800 SmartLine Pressure Transmitter is CSA-certified as a Dual Seal device in accordance with ANSI/ISA–12.27.01–2003, "Requirements for Process Sealing Between Electrical Systems and Flammable, or Combustible Process Fluids."

3.6.8 Explosion-Proof Conduit Seal

When installed as explosion proof in a Division 1 Hazardous Location, keep covers tight while the Transmitter is energized. Disconnect power to the Transmitter in the non-hazardous area prior to removing end caps for service.

When installed as non-incendive equipment in a Division 2 hazardous location, disconnect power to the Transmitter in the non-hazardous area, or determine that the location is non-hazardous before disconnecting or connecting the Transmitter wires.

Transmitters installed as explosion proof in Class I, Division 1, Group A Hazardous (classified) locations in accordance with ANSI/NFPA 70, the US National Electrical Code, with 1/2 inch conduit do not require an explosion-proof seal for installation. If 3/4 inch conduit is used, a LISTED explosion proof seal to be installed in the conduit, within 18 inches (457.2 mm) of the transmitter.

3.7 Startup

3.7.1 Overview

This section identifies typical start up tasks associated with several generic pressure measurement applications. It also includes the procedure for running an optional analog output check.

Startup Tasks

After completing the installation and configuration tasks for a Transmitter, you are ready to start up the process loop. Startup usually includes:

- Checking zero input
- Reading inputs and outputs
- Applying process pressure to the transmitter.

You can also run an optional output check to *wring out* an analog loop and check out individual Process Variable (PV) outputs in Digitally Enhanced (DE) mode before startup.

The actual steps in a startup procedure vary based on the type of Transmitter and the measurement application. In general, the procedures in this section are based on using Honeywell MC Toolkit to check the Transmitter input and output under static process conditions, and make adjustments as required initiating full operation with the running process. Note that like checks can be made using the optional three-button assembly, if your Transmitter is so equipped. Operation with the three-button assembly is discussed in the "Operation" section of this manual.

3.7.3 Output Check Procedures

The Output Check comprises the following procedures:

- The Loop Test procedure checks for continuity and the condition of components in the output current loop.
- The Trim DAC Current procedure calibrates the output of the Digital-to-Analog converter for minimum (0%) and maximum (100%) values of 4 mA and 20 mA, respectively. This procedure is used for Transmitters operating online in analog mode to ensure proper operation with associated circuit components (for example, wiring, power supply,…, control equipment). Precision test equipment (an ammeter or a voltmeter in parallel with precision resistor) is required for the Trim DAC Current procedure.
- The Apply Values procedure uses actual Process Variable (PV) input levels for calibrating the range of a Transmitter. To measure a liquid level for example, a sight-glass can be used to determine the minimum (0%) and maximum (100%) level in a vessel. The PV is carefully adjusted to stable minimum and maximum levels, and the Lower Range Limit Value (LRV) and Upper Range Limit Value (URV) are then set by commands from the MC Toolkit.

The Transmitter does not measure the given PV input or update the PV output while it operates in the Output mode.

3.7.4 Constant Current Source Mode Procedure

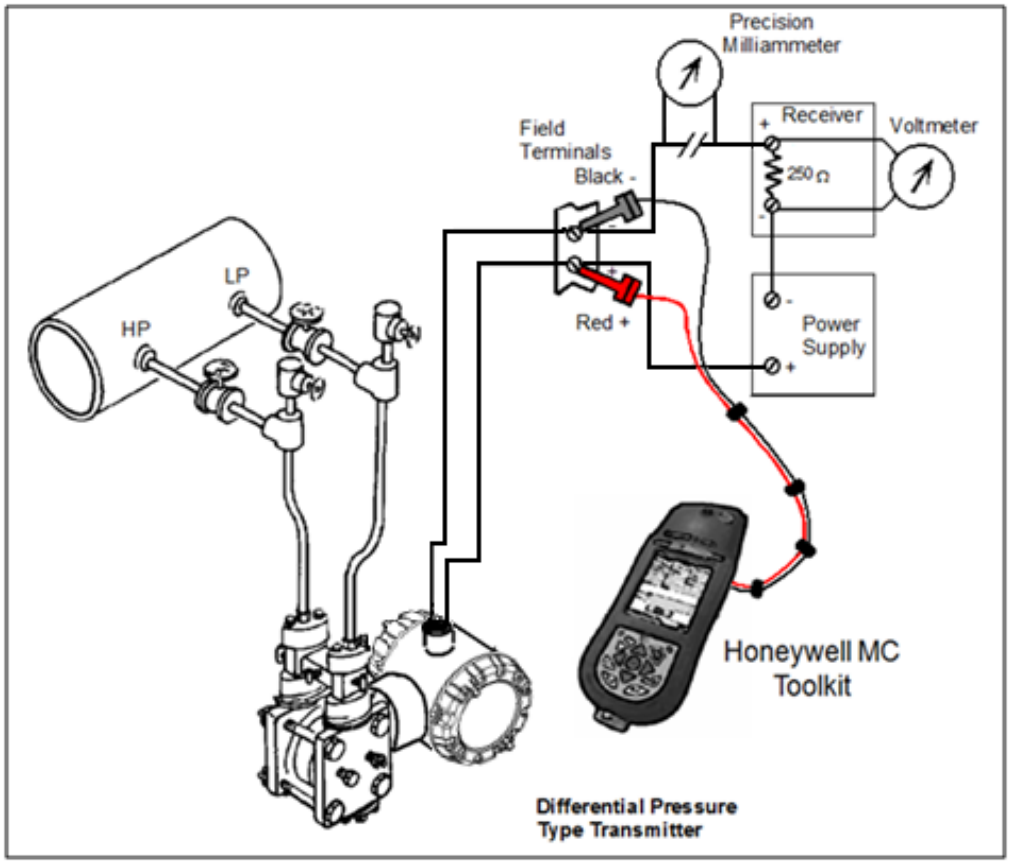

Figure 16 – Current Loop Test Connections

1. Refer to Figure 16 for test connections. Verify the integrity of electrical components in the output current loop.
2. Establish communication with the Transmitter. For these procedures, the values of components in the current loop are not critical if they support reliable communication between the Transmitter and the Toolkit.
3. On the Toolkit, display the **Output Calibration** box.
4. In the Output Calibration box, select the **Loop Test** button; the **LOOP TEST** box will be displayed.
5. Select the desired constant-level Output: 0 %, 100 %, or Other (any between 0 % - 100 %).
6. Select the Set button. A box will be displayed asking **Are you sure you want to place the transmitter in output mode?**

   With the Transmitter in Analog mode, you can observe the output on an externally-connected meter or on a local meter. In DE mode, you can observe the output on the local meter or on the Toolkit Monitor display.

7. Select the **Yes** button. Observe the output current at the percentage you selected in Step 5.
8. To view the monitor display, navigate back from the **LOOP TEST** display, and select the **MONITOR** display. A **Confirm** popup will be displayed.
9. Select **Yes** to continue. This concludes the Startup procedure.

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4 Operation

4.1 Overview

This section provides the information and processes involved for both Digitally Enhanced (DE) and HART operation using the 3-button option.

4.2 Three-Button Operation

The ST 800 optional three-button interface provides a user interface and operation capability without opening the transmitter. Figure 17 shows the location of the three-button option and the labels for each button.

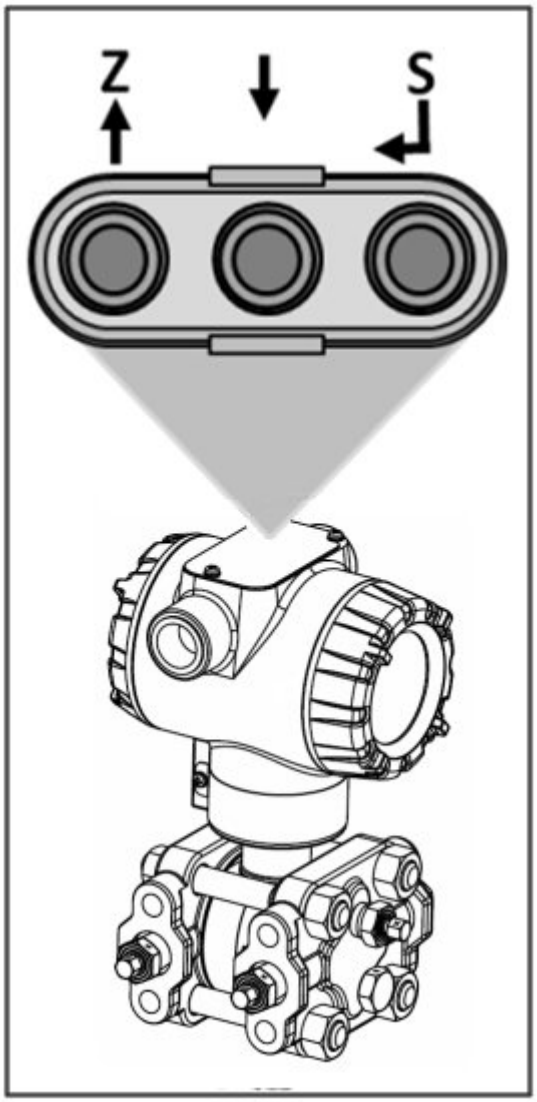


Figure 17 – Three-Button Option

Table 7 – Three-Button Option Functions

Physical Button	Basic Display	Advanced Display	Action
Left ↑	Increment Previous Menu Item	Increment Move cursor Up	Scroll to previous menu item in an active list. Scroll through alphanumeric list to desired character (ex. for entering Tag names or numeric values)
Center ↓	Decrement Next Menu Item	Decrement Move cursor Down	Scroll to next menu item in an active list. Scroll through alphanumeric list to desired character (ex. for entering Tag names or numeric values)
Right ↵	Select displayed menu item for activation or editing	Enter	Call up the Main Menu. Call up a lower-level menu. Select an item for data entry. Confirm a data entry operation Activate the service associated with a selected menu item.

4.2.1 Menu Navigation

The behavior of the buttons is the same for both the Basic and Advanced Displays. The user must press ↵ button to call up the Main Menu. To exit the Main Menu and return to the PV display screen, select **<EXIT>**.

Use the ↑ and ↓ buttons to scroll through the list of menu items. Press the ↵ button to select an item for data entry or activation. When an item is selected for data entry or activation, the cursor will jump to the lower line of the LCD (Basic Display) or call up a pop-up window (Advanced Display) to allow editing of the value. No action is taken against a menu item until the ↵ button is pressed.

If a user presses the ↵ button to begin a data entry operation, they must press another button within 10 seconds or the transmitter firmware will assume that the user wants to abort the operation or has walked away from the transmitter. After 10 seconds with no action, the data entry will time out and the original value of the parameter will be preserved.

4.2.2 Data Entry

Data entry is performed from left to right. Select a character / digit by pressing ↑ or ↓ buttons, and then press ↵ to advance to the next character position to the right. Select the cross-hatch character ▒ to terminate the entry or if the final character is already a space character, just press ↵ again.

All numeric entries are clamped at the low or high limit if needed. You can determine the low and high limit for a parameter by selecting either the ▲ or ▼ character while the cursor is positioned over the left-most digit and press ↵ button. The Display will show the selected limit.

Table 8 – Three-Button Data Entry

Screen Symbol	Numeric data entry	Text entry
▲	Display the high limit for this parameter. This symbol only appears in the left-most position of the data entry field.	Not Available
▼	Display the low limit for this parameter. This symbol only appears in the left-most position of the data entry field.	Not Available
▒	Terminate the numeric entry	Terminate the text entry
0 thru 9, Minus, Decimal	These characters are used to enter numeric values. The minus sign only appears in the left-most digit.	These characters can be used to create custom tags and unit labels
A thru Z, 0 thru 9 special symbols	Not Available	These characters can be used to create custom tags and unit labels

4.2.3 Editing a Numeric Value

Editing a Numeric Value
Editing of a numeric value is a digit-by-digit process, starting with the left-most digit.

1. Press ↵ to begin the edit process.
2. The Basic Display will show the current value of the item on the lower line, left justified. The Advanced Display will show the current value of the item in a pop-up window in the middle of the screen
3. Press the ↑ or ↓ buttons to select the desired digit, and then press ↵ to advance to the next digit to the right.
4. After the last digit has been entered, press ↵ one more time to write the new value to the transmitter.

4.2.4 Selecting a new setting from a list of choices

Use the procedure described below to select a new setting for parameters that present a list of choices (e.g., Screen Format, Display Units, etc.).

1. Press ↵ to begin the edit process.
    a. The Basic Display will show the current setting of the item on the lower line, left justified.
    b. The Advanced Display will show the current setting of the item in a pop-up window.
2. Press the ↑ or ↓ buttons to scroll through the list of choices.
3. Press ↵ to make your selection. The new selection will be stored in the transmitter and will be displayed on the lower line, right justified.

4.2.5 The Advanced Display Menus

The Advanced Display menus are organized into three levels, as shown by Table 9. There is a **<Return>** menu item at each level that allows the user to return to the previous level.

Table 9 – Advanced Display Main Menu Structure

Level 1	Level 2	Level 3
<Exit>	n/a	n/a
Diagnostics	Critical Non-Critical	For details go to the Diagnostics Menu table
Display Setup	LCD Contrast Common Setup Screen 1 Screen 2 … Screen 8	For details go to the Display Setup Menu table. Note that the Advanced Display supports the configuration of up to 8 different screens.
Calibration	Set Time Stamp Zero Correct LRV Correct URV Correct Reset Corrects DAC Trim Loop Test	For details go to the Calibration Menu table.
Transmtr Setup	Parameters Enter LRV Enter URV Set LRV Set URV Install date	For details go to the Transmitter Setup Menu table.
Information	Display Elec Module Meterbody	For details go to the Information Menu table.

Table 10 –Diagnostics Menu

All Diagnostics menu items are Read Only.

<Return> Return to the Level 1 menu			
Critical	<Return>		
	Active Diags	# #	Description
	Meterbody	OK FAULT	FAULT: There is a problem with the Meterbody
	Elec. Module	OK FAULT	FAULT: There is a problem with the Electronics Module (HART, DE, or FF)
	Meterbody Comm	OK FAULT	FAULT: There is a problem with the interface between the Meterbody and the Electronics Module.
Non Critical	<Return>		
	Active Diags	# #	Shows the number of Non-Critical Diagnostics that are currently active
	Analog Out mode	Normal FIXED OUTPUT	Normal indicates that the Loop Output reflects the current value of the PV. FIXED OUTPUT indicates that the Loop Output of the transmitter is manually set a fixed value, probably due to a DAC Trim or Loop Test operation that is currently in progress.
	Zero Correct	OK EXCESSIVE	EXCESSIVE: Input applied exceeds 5% of expected value (as defined by LRV).
	Span Correct	OK EXCESSIVE	EXCESSIVE: Input applied exceeds 5% of expected value (as defined by URV).
	Supply Voltage	OK LOW HIGH	LOW: Supply voltage is below the low specification limit HIGH: Supply voltage is above the high specification limit.
	Primary PV	OK OVERLOAD	OVERLOAD: Input pressure is greater than 200% URL (DP) or 150% URL (GP, AP)
	Meterbody Temp	OK OVER TEMP	OVERTEMP: Meterbody temperature is greater than 125C
	Elec Module Temp	OK OVER TEMP	OVERTEMP: Electronics temperature is greater than 85C
	Meterbody Comm	OK SUSPECT	SUSPECT: The interface between the Meterbody and the Electronics Module is experiencing intermittent communication failures.
	Factory	OK	The transmitter has not been

	Cal	NO FACTORY CAL	calibrated by the factory.
	DAC Temp Comp	OK NO COMPENSATION	The DAC has not been compensated for temperature effects. This is a factory operation.

Table 11 –Display Setup Menus

<Return> Return to the Level 1 menu				
LCD Contrast	<Return>			
	Set Contrast	# #	Adjust the LCD contrast level. Range from 0 to 9. Default: 5	Press ↵ to enter menu selection ↑ and ↓ to select number. ↵ to enter and shift to next digit
Common Setup	<Return>			
	Language	English, French, German, Spanish, Russian	Select the language for the Display. Default: English	Press ↵ to enter menu selection ↑ and ↓ to select from list. ↵ to enter
	Rotation Time	# #	Time duration, in seconds, that each configured screen is shown before moving to the next screen. Range: 3 to 30 seconds Default: 10 seconds	Press ↵ to enter menu selection ↑ and ↓ to select number. ↵ to enter and shift to next digit
Screens 1 thru 8	<Return>			
	Screen Format	None PV PV & Bar Graph PV & Trend	Select the Screen format from the list.	Press ↵ to enter menu selection ↑ and ↓ to select from list. ↵ to enter
	Trend Duration	##	Select the amount of historic data visible on the Trend screen. Range: 1 to 24 hours. Applies to the “PV & Trend” format only	Press ↵ to enter menu selection ↑ and ↓ to select number. ↵ to enter and shift to next digit
	PV Selection	DP, AP, or GP Pressure Meterbody Temp Loop Output Percent Output Static Press	Select the Process Variable (PV) that will be shown this screen.	Press ↵ to enter menu selection ↑ and ↓ to select from list. ↵ to enter

<table>
<tr><td rowspan="8">Screens
1 thru 8
(continued)</td><td rowspan="6">PV Scaling</td><td>None</td><td colspan="3">Display the PV in the default units associated with the PV Selection. Default units:
• Pressure:inH2O@ 39ºF
• Meterbody Temp: ºC
• Loop Output: mA
• Percent Output: %
• Static Pressure: psi</td><td rowspan="6">Press ↵ to enter menu selection
↑ and ↓ to select from list.
↵ to enter

Custom Units:
↑ and ↓ to select Alphanumeric
↵ to enter and shift to next char</td></tr>
<tr><td>Convert Units</td><td colspan="3">Convert the displayed PV to any pressure unit listed under Display Units</td></tr>
<tr><td>Linear
See Note 1 below</td><td>Display Units</td><td>Custom</td><td>Units up to 8 char</td></tr>
<tr><td rowspan="5">Square Root
(only available for DP transmitters)

See Note 2 below.</td><td rowspan="5">Display Units</td><td colspan="2">%</td></tr>
<tr><td>Custom Units</td><td>up to 8 char</td></tr>
<tr><td colspan="2">gal/min</td></tr>
<tr><td colspan="2">gal/h</td></tr>
<tr><td colspan="2">L/m</td></tr>
<tr><td>Display Units</td><td>atm , bar,
ftHO @ 68ºF
gf / cm2
inH2O @ 39ºF
inH2O @ 60ºF
inH2O @ 68ºF
inHg @ 0ºC
kgf/cm2, kPa,
mbar
mmH2O @ 4ºC
mmH2O @ 68ºF
mmHg @ 0ºC
MPa, Pa,
psi, Torr,
^{o}C, ^{o}F, ^{o}R, K</td><td colspan="3">Select the Display Units for the selected PV.</td><td>Press ↵ to enter menu selection

↑ and ↓ to select from list.
↵ to enter</td></tr>
<tr><td>Custom Units</td><td>□□□□□□□□</td><td colspan="3">Enter custom text using any alphanumeric value up to 8 characters long. Custom Units is only available if PV Scaling is set to Linear or Square Root.</td><td>Custom Units:
↑ and ↓ to select Alphanumeric
↵ to enter and shift to next cha</td></tr>
</table>

	Decimal	None X.X X.XX X.XXX	Select the decimal resolution for the PV.	Press ↵ to enter menu selection ↑ and ↓ to select from list. ↵ to enter
	Disp Low Limit	#########	Enter the lower limit shown on the Bar Graph or Trend screen	Press ↵ to enter menu selection ↑ and ↓ to select number. ↵ to enter and shift to next digit
	Disp High Limit	#########	Enter the upper limit shown on the Bar Graph or Trend screen.	
	Scaling Low	#########	Enter the low and high scaling limits. These limits are used to scale the displayed PV to the desired value when PV Scaling is set to either Linear or Square Root.See Notes 1 and 2 Below.	
	Scaling High	#########		
	Custom Tag	□□□□□□□□□□□□□	Enter Custom Tag using any alphanumeric value up to 14 characters long.	Press ↵ to enter menu selection ↑ and ↓ to select Alphanumeric ↵ to enter and shift to next char.

NOTES:

Scaling only affects the value shown on the Display; it does not affect the Loop Output.

1. **Linear scaling of the displayed PV value**
   When "Linear" is selected for PV Scaling, the Display will scale the selected PV input according to the following formula:

   ((PV value – input low limit) / input span) x (Scaling High – Scaling Low) + Scaling Low

   If the PV Selection is Pressure, the input low and high limits are the LRV and URV respectively. If the PV Selection is Percent Output, the input low and high limits are 0 and 100%. If the PV Selection is Square Root, the input low and high limits are 0 and 100 %Flow.

   Note that this scaling only affects the value shown on the Display; it does not affect the Loop Output. 2

2. **Square Root scaling of the displayed PV value**
   When "Square Root" is selected for PV Scaling, the Display computes %Flow from the Differential Pressure. This calculation is independent of the Transfer Function setting in the transmitter. This allows the user to output Differential Pressure via the 4-20 mA loop output while displaying the equivalent flow value on the Display. In addition, the

Display value can be scaled to show the flow in flow units (gal/min, gal/h, etc.) by entering the correct scaling limits via the Scaling Low and Scaling High parameters.

For example:

PV Selection:	Differential Pressure
PV Scaling:	Square Root
Scaling Low:	0.0
Scaling High:	2500.0
Display Units:	gal/h
LRV:	0.0
URV:	set as required by the process

The Display will calculate 0-100 %Flow from the Differential Pressure and then scale this to 0 to 2500 gal/h.

Note that the Square Root calculation is referenced to the LRV and URV settings of the transmitter and its uses the LRV and URV to calculate the %DP input into the Square Root flow algorithm. For normal flow applications, it is assumed that the LRV is set to zero and that zero pressure equals zero flow. If the LRV is less than zero, the Square Root calculation will calculate the flow as bi-directional flow.

Table 12 –Calibration Menus

<Return> Return to the Level 1 menu				
Set Time Stamp	**<Return>**			
	Hour	# #	These selections allow the user to enter a time stamp for the Zero Correct, LRV Correct, URV Correct, and Reset Corrects. This time stamp can be read via HART and FF communications.	Press ↵ to enter menu selection ↑ and ↓ to select number. 4.2.6 ↵ to enter and shift to next digit ↑ and ↓ to select from list. ↵ to enter
	Minute	# #		
	Year	# # # #		
	Month	January thru December		
	Day	# #		
Zero Correct	**<Return>**			
	Do Zero Corr.	Executing this selection corrects the Zero based on the input pressure. The current live value of the primary pressure input is shown on this display so the user can easily see the effect of the Zero correction.		Press ↵ to enter menu selection Scroll to Do Zero Corr. Press ↵ to initiate
LRV Correct	**<Return>**			
	Do LRV Correct	Executing this selection corrects the LRV based on the input pressure. The current live value of the primary pressure input is shown on this display so the user can easily see the effect of the LRV correction.		Press ↵ to enter menu selection Scroll to Do LRV Correct Press ↵ to initiate
URV Correct	**<Return>**			
	Do URV Correct	Executing this selection corrects the URV based on the input pressure. The current live value of the primary pressure input is shown on this display so the user can easily see the effect of the URV correction.		Press ↵ to enter menu selection Scroll to Do URV Correct Press ↵ to initiate
Reset Corrects	**<Return>**			
	Reset Corrects	Executing this selection Resets the Zero, LRV, and URV Corrects back to Factory values		Press ↵ to enter menu selection Scroll to Reset Corrects Press ↵ to initiate
DAC Trim Note: Loop must be removed from Automatic Control	**<Return>**			
	Trim Zero	This selection will calibrate the loop zero output to 4.000 mA Connect a current meter to the transmitter to monitor the loop output. When you press Enter, the transmitter will set the loop output to 4 mA. When the prompt “Enter reading” appears, enter the value shown on the current meter (in milliamps) and press Enter again. The transmitter will adjust the DAC output to 4mA.		Press ↵ to enter menu selection Scroll to Trim Zero or Trim Span Press ↵ to initiate ↑ and ↓ to select number. ↵ to enter and shift to next digit

	Trim Span	This selection will calibrate the loop span output to 20.000 mA Connect a current meter to the transmitter to monitor the loop output. When you press Enter, the transmitter will set the loop output to 20 mA. When the prompt "Enter reading" appears, enter the value shown on the current meter (in milliamps) and press Enter again. The transmitter will adjust the DAC output to 20 mA.	
	Set DAC Normal	This selection allows the loop to be returned to its Normal mode (Automatic Control) after performing the Trim operation.	Press ↵ to enter menu selection Scroll to Set DAC Normal Press ↵ to initiate
Loop Test Note: Loop must be removed from Automatic Control	**<Return>**		
	Set DAC Output	This selection allows the user to force the DAC output to any value between 3.8 and 20.8 mA. Note: This selection will put the DAC into Fixed Output Mode.	Press ↵ to enter menu selection Scroll to Set DAC Output Press ↵ to initiate ↑ and ↓ to select number. ↵ to enter and shift to next digit
	Set DAC Normal	This selection allows the loop to be returned to its Normal mode (Automatic Control) after performing the Set DAC Output operation	Press ↵ to enter menu selection Scroll to Set DAC Normal Press ↵ to initiate

Table 13 –Transmitter Setup Menus

<Return> Return to the Level 1 menu				
Parameters	**<Return>**			
	Tag ID	□□□□□□□□	Enter Tag ID name up to 8 characters long. □ = any Alphanumeric value	Press ↵ to enter menu selection ↑ and ↓ to select Alphanumeric ↵ to enter and shift to next character to the right.
	Units	atm	This selection determines the units of the values shown on the following menu items: • Enter LRV • Enter URV • Set LRV • Set URV • Zero Correct (Calib. menu) • LRV Correct(Calib. menu) • URV Correct(Calib. menu) • LRL (Meterbody Info. menu) • URL (Meterbody Info. menu) For calibration, this parameter allows the user to match the value displayed on the menus to the units supported by the user's calibration equipment.	Press ↵ to enter menu selection ↑ and ↓ to select from list ↵ to enter
		bar		
		ftH2O @ 68ºF		
		gf / cm2		
		inH2O @ 39ºF		
		inH2O @ 60ºF		
		inH2O @ 68ºF		
		inHg @ 0ºC		
		kgf/cm2		
		kPa		
		mbar		
		mmH2O @ 4ºC		
		mmH2O @ 68ºF		
		mmHg @ 0ºC		
		MPa		
		Pa		
		psi		
		Torr		
	Damping (sec)	##. #	Selection applies digital filtering to suppress noise effects on the PV. The limits for this value are 0.0 to 32.0 seconds	
	NAMUR Selection	Disabled	Disabling sets the loop output and burnout levels to the Honeywell levels	Press ↵ to enter menu selection ↑ and ↓ to select from list ↵ to enter
		Enabled	Enabling sets the loop output and burnout levels to the NAMUR levels	
	Filter Performance	Fast SOR	Fast Speed of Response	
		Std SOR	Standard Speed of Response	

Parameters	Transfer Function	Linear	The loop output of the transmitter is a linear representation of the differential pressure.	Press ↵ to enter menu selection ↑ and ↓ to select number. ↵ to enter and shift to next digit
		Square Root	The loop output of the transmitter represents %Flow as defined by the DP Square Root flow equation.	
	Flow Cutoff	Single Breakpt	Allows the user to specify a single breakpoint as the low flow cutoff point. This item is only available when the Transfer Function is set to Square Root.	
		Dual Slope	Uses a dual slope formula to determine the low flow cutoff point. This item is only available when the Transfer Function is set to Square Root.	
	Breakpt(%Flow)	##. #	Enter the low flow cutoff point when Single Breakpt is selected. Range: 0 to 25.0 %Flow.	
Enter LRV	**<Return>**			
	Enter LRV	###. ##	The limit for the Lower Range Value is 2X the Lower Range Limit (LRL) of the Meterbody	
Enter URV	**<Return>**			
	Enter URV	###. ##	The limit for the Upper Range Value is 2X the Upper Range Limit (URL) of the Meterbody	
Set LRV	**<Return>**			
	Set LRV	ATTENTION: Executing this service will set the Lower Range Value (LRV) equal to the input pressure		Press ↵ to enter menu selection ↵ to execute
Set URV	**<Return>**			
	Set URV	ATTENTION: Executing this service will set the Upper Range Value (URV) equal to the input pressure		Press ↵ to enter menu selection ↵ to execute

Install Date	**<Return>**			
	Year	# # # #	Enter the current year. This item will only be visible if no Install Date has been written to the transmitter.	
	Month	January thru December	Select the current month. This item will only be visible if no Install Date has been written to the transmitter.	
	Day	# #	Enter the day of the month. This item will only be visible if no Install Date has been written to the transmitter.	
	Install Date	dd-mmm-yyyy	If no Install Date has been set in the transmitter, this value is a preview of the Year, Month, and Day entered above. Otherwise, this is the Install Date that was previously written to the transmitter.	
	Write Date	Press ENTER to write the Install Date to the transmitter. **CAUTION**: The Install Date can only be written once in the life of the transmitter. You cannot erase or overwrite the Install Date once it has been written.		

Table 14 –Information Menus

<Return> Return to the Level 1 menu			
Display	**<Return>**		
	Firmware Version	The firmware version of the Display Module	Read Only
Elec Module	**<Return>**		
	Firmware Version	The firmware version of the Electronics Module	Read Only
	HART/DE Version	The firmware version number of the Electronics Module as displayed via the HART and DE protocols	Read Only
	Protocol	The communications protocol of the transmitter: • HART: HART protocol • DE: Honeywell DE protocol • FF: Foundation Fieldbus	Read Only
Meterbody	**<Return>**		
	Firmware Version	The firmware version of the Meterbody	Read Only
	Model Key	Identifies the type and range of the transmitter	Read Only
	Units	The Engineering Units for the LRL and URL. Note that you can change these Units from the Transmitter Setup menu, if desired (Transmtr Setup\Parameters\Units)	Read Only
	LRL	The Lower Range Limit of the Meterbody	Read Only
	URL	The Upper Range Limit of the Meterbody	Read Only

4.2.7 The Basic Display Menu

The Basic Display Menu is implemented as one long single-level menu and will "wrap around" when it reaches the start or end of the menu. Operation is as follows:

Press the ↵ button to call up the Menu.

1. Select **<Exit Menu>** and press ↵ to exit the Menu.
2. Use the ↑ and ↓ buttons to scroll through the list of menu items.
3. Press the ↵ button to select an item for data entry or activation. When an item is selected for data entry or activation, the cursor will jump to the lower line of the LCD to allow editing of the value. No action is taken against a menu item until the user presses the ↵ button.
4. If you want to abort a data entry operation, simply refrain from pushing any buttons for 10 seconds; the data entry operation will time out and the original value of the selected item will be preserved.

Table 15 – The Basic Display Menus

<table>
<tr><td>LCD Contrast</td><td>»»»»»»</td><td colspan="2">Adjust the LCD contrast level.
Range from » (1) to »»»»»»»»»» (9)
Default: »»»»»»»» (7)</td><td>Press ↵ to enter menu selection

↑ and ↓ to select level.
↵ to enter</td></tr>
<tr><td rowspan="3">PV Display</td><td>Pressure</td><td>Pressure Units</td><td rowspan="3">Select Process Variable (PV) to be shown on the display from list.</td><td rowspan="5">

Zero Correct	Do Correct	Executing this selection corrects the Zero based on the input pressure	Press ↵ to enter menu selection Press ↵ to initiate action
LRV Correct	Do Correct	Executing this selection corrects the LRV based on the input pressure	
URV Correct	Do Correct	Executing this selection corrects the LRV based on the input pressure	
Reset Corrects	Do Correct	Executing this selection Resets the Zero, LRV, and URV Corrects back to Factory values	
DAC Zero Trim Note: Loop must be removed from Automatic Control	DAC Zero Trim	This selection allows the loop zero output 4mA value to be trimmed. Note: You must connect a current meter to the transmitter to monitor the loop output.	Press ↵ to enter menu selection ↑ and ↓ to select number. ↵ to enter and shift to the next digit to the right
DAC Span Trim Note: Loop must be removed from Automatic Control	DAC Span Trim	This selection allows the loop span output 20mA value to be trimmed. Note: You must connect a current meter to the transmitter to monitor the loop output.	
Loop Test Note: Loop must be removed from Automatic Control	Loop Test 12.000	This selection allows the user to force the DAC output to any value between 3.8 and 20.8 mA. Note: This selection will put the DAC into Fixed Output Mode, as indicated by the flashing output value. Navigation away from this menu item will return the loop to Normal (Automatic) Mode.	
LRV URV	#. ## #. ##	The limits are: 2X the Lower Range Limit (LRL) of the Meterbody and 2X the Upper Range Limit (URL) of the Meterbody	Press ↵ to enter menu selection ↑ and ↓ to select number. ↵ to enter and shift to the next digit to the right
Damping	#. ##	Selection applies digital filtering to suppress noise effects on the PV. The limits for this value are 0.0 to 32.0 seconds	
NAMUR	Enabled Disabled	Disabling sets the loop output and burnout levels to the Honeywell levels	Press ↵ to enter menu selection ↑ and ↓ to select from list ↵ to enter
Filter Perf	Fast SOR Standard SOR	Fast Speed of Response Standard Speed of Response	

Transfer Function (only available for DP Transmitters)	Linear	The loop output of the transmitter is a linear representation of the differential pressure	Press ↵ to enter menu selection ↑ and ↓ to select Alphanumeric ↵ to enter and shift to next character to the right.
	Square Root	The loop output of the transmitter represents %Flow as defined by the DP Square Root flow equation.	
Flow Cutoff	Single Breakpt	Allows the user to specify a single breakpoint as the low flow cutoff point. This item is only available when the Transfer Function is set to Square Root.	
	Dual Slope	Uses a dual slope formula to determine the low flow cutoff point. This item is only available when the Transfer Function is set to Square Root.	
Flow Breakpoint	##. #%	Enter the low flow cutoff point when Single Breakpt is selected. Range: 0 to 25.0 %Flow.	
Tag ID	□□□□□□□□	Enter Tag ID name up to 8 characters long. □ = any Alphanumeric value	Press ↵ to enter menu selection ↑ and ↓ to select Alphanumeric ↵ to enter and shift to next character to the right.
Install Date	DD MM YYYY	This selection allows the user to enter the date a transmitter is installed. The Install Date is entered in sequence of Day, Month, and Year, followed by the new date and the prompt Write Date to confirm the entry. **CAUTION**: The Install Date can only be written once in the life of the Transmitter. You cannot erase or overwrite the Install Date once it has been written.	Press ↵ to enter menu selection ↑ and ↓ to select number ↵ to enter and shift to next digit to the right. Read Only after entered
Firmware	Display Electronics Meterbody	Menu item shows the current Firmware versions of the Display, Electronics Module and the Meterbody	Read Only Parameter
Protocol	HART DE	Menu item shows the communications protocol	
Model Key		Identifies the type and range of the transmitter	Read Only Parameter
<Exit Menu>			

4.2.8 Selecting a new setting from a list of choices

Use the procedure described below to select a new setting for parameters that present a list of choices (e.g., PV Display, Pressure Units, etc.)

1. Press ↵ to begin the edit process. The Basic Display will show the current setting of the item on the lower line, left justified.
2. Press the ↑ or ↓ buttons to scroll through the list of choices.
3. Press ↵ to make your selection. The new selection will be stored in the transmitter and displayed on the lower line, right justified.

4.3 Three Button Operation with no Display Installed

When there is no Display installed, the buttons can be used to perform a Zero or Span adjustment of the Transmitter. Caution should be taken to insure these adjustments are only made when the correct input pressures are applied.

4.3.1 Zero Adjustment

This adjustment is the same as performing a Set LRV using the Display.

1. Connect a current meter or voltmeter as shown in Figure 16 to monitor the PV output of the Transmitter.
2. Using an accurate pressure source, apply pressure equivalent to the Transmitter LRV.
3. Press the Down (↓) and Zero (↑) buttons together to set the Zero.
4. Verify that the output is now 4 mA.

4.3.2 Span Adjustment

This adjustment is the same as performing a Set URV using the Display.

1. Connect a current meter or voltmeter as shown in Figure 16 to monitor the PV output of the Transmitter.
2. Using an accurate pressure source, apply pressure equivalent to the desired Upper Range Value of the transmitter.
3. Press the **Down (↓)** and **Span (↵)** buttons together to set the span.
4. Verify that the PV output is now 20 mA.

You can also use the MCT 202 Toolkit to make any adjustments to an ST 800 SmartLine Pressure Transmitter. Alternately, certain adjustments are possible through an Experion Station or Universal Station, if the ST 800 is digitally integrated with either of these stations.

4.4 Changing the Default Failsafe Direction

Transmitters are shipped with a default failsafe direction of upscale. This means that the Transmitter output will set the current output to upscale failsafe (maximum output) upon detection of a critical status. You can change the direction from upscale failsafe to downscale failsafe (minimum output) by moving the top jumper located in the Electronics module.

4.4.1 DE and Analog Differences

Failsafe operation is somewhat different between DE and analog operation:

- **Analog operation** – Upscale failsafe drives the Transmitter output to 21.8 mA. Downscale failsafe drives the Transmitter output to 3.8 mA.
- **DE operation** – Upscale failsafe causes the Transmitter to generate a **+ infinity** digital signal. Downscale failsafe causes the Transmitter to generate a **– infinity** digital signal.

The Transmitter electronics module interprets either signal as *not-a-number* and initiates its own configured failsafe action for the control system.

4.4.2 Procedure to Establish Failsafe Operation

The failsafe direction display accessible via the Toolkit shows only the state of the jumper as it correlates to analog Transmitter operation. Failsafe action for the DE control system may be configured to operate in a manner different from analog, as indicated by the state of the Transmitter jumper.

The integrated circuits in the Transmitter PWA are vunerable to damage by stray static discharges when removed from the Electronics Housing. Minimize the possibility of static discharge damage when handling the PWA as follows:

Do not touch terminals, connectors, component leads, or circuits when handling the PWA.

When removing or installing the PWA, handle it by its edges or bracket section only. If you need to touch the PWA circuits, be sure you are grounded by staying in contact with a grounded surface or by wearing a grounded wrist strap.

When the PWA is removed from the Transmitter, put it in an electrically conductive bag, or wrap it in aluminum foil to protect it.

The following procedure outlines the steps for positioning the write protect and failsafe jumpers on the electronics module. See Figure 18 for the locations of the failsafe and write protect jumpers.

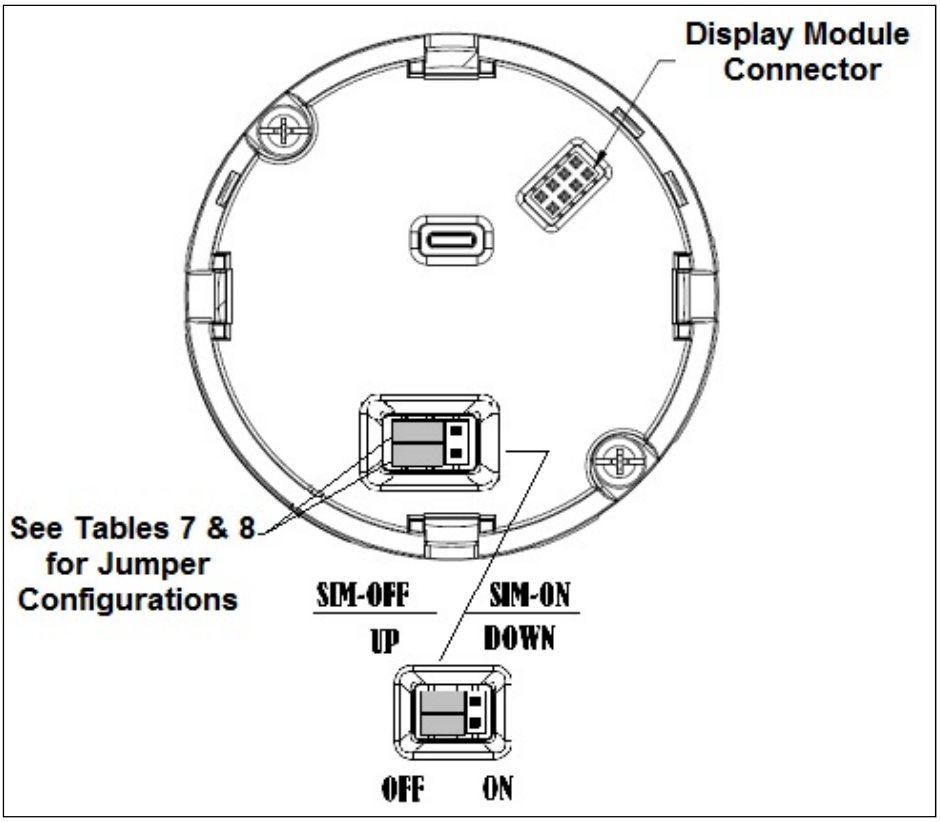


Figure 18 – Locating the Failsafe and Write Protect Jumpers

Table 16 – Hart and DE Failsafe and Write Protect Jumpers

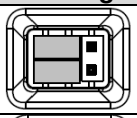
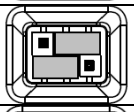
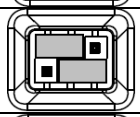
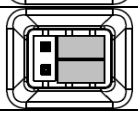
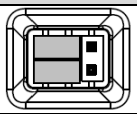
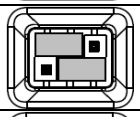
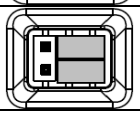
Jumper Arrangements	Description
	Failsafe = UP (High) Write Protect = OFF (Not Protected)
	Failsafe = DOWN (Low) Write Protect = OFF (Not Protected)
	Failsafe = UP (High) Write Protect = ON (Protected)
	Failsafe = Down (Low) Write Protect = On (Protected)

Table 17 – Fieldbus Simulation and Write Protect Jumpers

Image	Description
	Fieldbus Simulation Mode = OFF Write Protect = OFF (Not Protected)
	Fieldbus Simulation Mode = OFF Write Protect = ON (Protected)
	Fieldbus SIM Mode = ON Write Protect = OFF (Not Protected)

1. Turn OFF Transmitter power (Power removal is only required in accordance with area safety approvals. Power removal is only required in Class 1 Div 1 Explosionproof and Class 1 Div 2 environments).

2. Loosen the end cap lock, and unscrew the end cap from the electronics side of the Transmitter housing.

3. If equipped with a Display module, carefully depress the two tabs on the sides of the Display Module, and pull it off.

4. If necessary, unplug the interface connector from the Communication module. Do not discard the connector.

5. Set the Failsafe Jumper (top jumper) to the desired position (UP or DOWN). See

6.

7.

8. Table 16 and Table 17 for jumper positioning.

9. If applicable, re-install the Display module as follows:

   - Orient the display as desired.
   - Install the Interface Connector in the Display module such that it will mate with the socket for the display in the Communication module.
   - Carefully line up the display, and snap it into place. Verify that the two tabs on the sides of the display latch.

NOTE: Installing a Display Module into a powered transmitter may cause a temporary upset to the loop output value.

Orient the Display for proper viewing through the end cap window. You can rotate the meter mounting orientation in 90 ^{o} increments.

10. Restore transmitter power if removed.

\

4.5 Monitoring the Basic and Advanced Displays

This section describes the information shown on the operator screens of the Advanced and Basic Displays.

4.5.1 Basic Display

Figure 19 illustrates the Basic Display format with Process Variable (PV).

- The PV value is user-configurable. This field has 7 characters. The maximum allowable numeric value is 9999999 or -999999. If fractional decimals are configured, the fractional positions will be dropped, as required. If the PV value exceeds the above limits, it is divided by 1000 and "K" is appended to the result, allowing a maximum value with multiplier of 999999K or -99999K.
- Process Variable Tag is user-configurable from a HART Host. This field has 14 characters.
- Engineering Units. This field is user-configurable. This field has 8 characters.

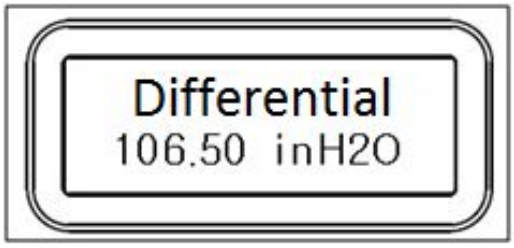


Figure 19 – Basic Display with Process Variable Format

4.5.2 Advanced Displays

As shown in Figure 20 , the Advanced Display provides three formats. lists and describes the fields in each of the three Advanced Display formats. Essentially, all three formats provide the same information, but with the following differences:

- Bar Graph. User Configurable 126 segment Bar Graph with range settings. The Bar Graph displays the current value of the configured PV.
- PV Trend. User-configurable display period from one hour to 24 hours. The chart displays minimum, maximum, and average of the configured PV over the selected trend period.

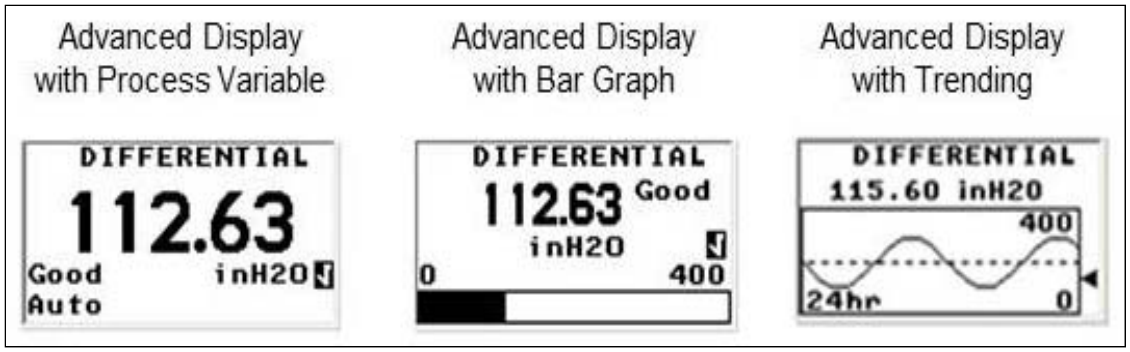


Figure 20 – Advanced Display Formats with the Process Variable

Table 18 – Advanced Displays with PV Format Display Indications

Display Indicator	What It Means
Diagnostic / Maintenance These indicators are displayed in the upper left corner of the screen when the associated conditions are present in the transmitter.	D Diagnostic condition present This indicator is displayed any time a diagnostic is present in the transmitter, either Critical or Non-Critical. If a Critical Diagnostic is present, the message "Critical Diag" will flash at the top of the screen and the appropriate Diagnostic screen will be inserted into the normal screen rotation. To determine which Non-Critical diagnostics are active, use the local buttons to call up the Non-Critical diagnostics menu (Main Menu\Diagnostics\Non-Critical. Refer to Table 10 for details concerning the Non-Critical diagnostics. M Maintenance Mode is active This indicator is set by the Experion DCS. When this Mode is active, a screen with the text "Available for Maintenance" will be inserted into the normal screen rotation to make it easy to identify transmitters that are available for maintenance.
PV Value	User Configurable. This field has 7 characters. Maximum allowable numeric value of 9999999 or -999999. If fractional decimals are configured, the fractional positions will be dropped as required. If the PV exceeds the values above limits, the PV is divided by 1000 and "K" is appended to the result, allowing a maximum value with multiplier of 999999K or -99999K

PV Status:	Good	The transmitter is operating normally
	Bad	The transmitter has detected a fault condition. The PV Status field will flash when this condition is present and the PV Value will be displayed on a black background as shown below:
	Unc	Uncertain (this status is only available for FF transmitters) The PV Value is outside of normal limits.

<table>
<tr><td>PV Function Block Mode</td><td colspan="4">The Function Block Mode is only displayed for Foundation Fieldbus transmitters. The eight possible Modes are shown below.</td></tr>
<tr><td></td><td colspan="2">OOS Out Of Service
Auto Automatic
Man Manual
Cas Cascade</td><td colspan="2">RCas Remote Cascade
Rout Remote Output
IMan Initialization Manual
LO Local Override</td></tr>
<tr><td>Process Variable Tag</td><td colspan="4">User Configurable. This field has 14 characters</td></tr>
<tr><td>Engineering Units</td><td colspan="4">User Configurable. This field has 8 characters</td></tr>
<tr><td></td><td>Pressure:
atm
bar
fttH2O
gf/cm2
inH20 @ 39F
inH20 @ 60F
inH20 @ 68F
inHg @ 0C
kgf/cm2</td><td>Pressure:
kPa
mbar
mmH2O @ 4C
mmH2O @ 68F
mmHg @ 0C
mPa
Pa
psi
Torr
mH2O @ 4C
mHg @ 0C</td><td>Temp:
° C
° F
° R
K (Kelvin)</td><td>Other:
Percent (%)
milliamp (mA)
Custom Text

Flow:
gal/min

4.5.3 gal/h

4.5.4 L/min

4.5.5 L/hr</td></tr>
<tr><td>Square Root Output</td><td colspan="4">This indicator is displayed when the Transfer Function of the transmitter is set to “Square Root”.

Note that this indicator is not displayed on the Trend screens.</td></tr>
<tr><td>Bar Graph</td><td colspan="4">The limits of the bar graph are user-configurable for each screen.</td></tr>
<tr><td>Trend graph</td><td colspan="4">The limits of the trend graph are user-configurable for each screen. The amount of time visible on the Trend graph is also configurable.</td></tr>
</table>

4.5.6 Button operation during monitoring

When the operator screens are active on the Advanced Display, the Increment and Decrement buttons (↑ and ↓) can be used to move to the next or previous operator screen without waiting for the rotation time to expire. Pressing the Enter button (↵) will call up the Main Menu.

5 Maintenance

5.1 Overview

This section provides information about preventive maintenance and replacing damaged parts. The topics covered in this section are:

- Preventive maintenance of the meter body barrier diaphragms and process piping to the Transmitter.
- Replacement of damaged parts such as the Transmitter Printed Wiring Assembly (PWA) and meter body

5.2 Preventive Maintenance Practices and Schedules

The ST 800 Transmitter does not require any specific maintenance at regularly scheduled intervals. However, it is recommended that you perform these typical inspection and maintenance routines on a schedule that is dictated by the characteristics of the process medium and if blow-down facilities or purge systems are being used.

- Check piping for leaks.
- Clear piping of sediment or other foreign matter.
- Clean the Transmitter process heads, including the barrier diaphragms.

5.3 Inspecting and Cleaning Barrier Diaphragms

Depending on the characteristics of the process medium, sediment or other foreign particles may collect in the process head cavity/chamber and cause faulty measurement. In addition, the barrier diaphragm(s) in the Transmitter meter body may become coated with residue from the process medium. The latter is also true for external diaphragms on flange-mount and remote seal type Transmitters.

In many cases, you can readily remove the process head(s) from the Transmitter meter body to clean the process head cavity and inspect the barrier diaphragm(s). For flange-mount and remote seal diaphragms, you may only need to run a purge line in the tank to rinse off the face of the diaphragm(s).

The following procedure comprises the general steps for inspecting and cleaning barrier diaphragms. You may have to modify these steps to meet your particular process or transmitter model requirements. Figure 21 shows an exploded view of a Differential Pressure (DP) Transmitter meter body for reference. For disassembly/reassembly purposes, Gauge Pressure (GP) and Absolute Pressure (AP) Transmitters are similar.

It is recommended that you remove the Transmitter from service and move it to a clean area before disassembling it.

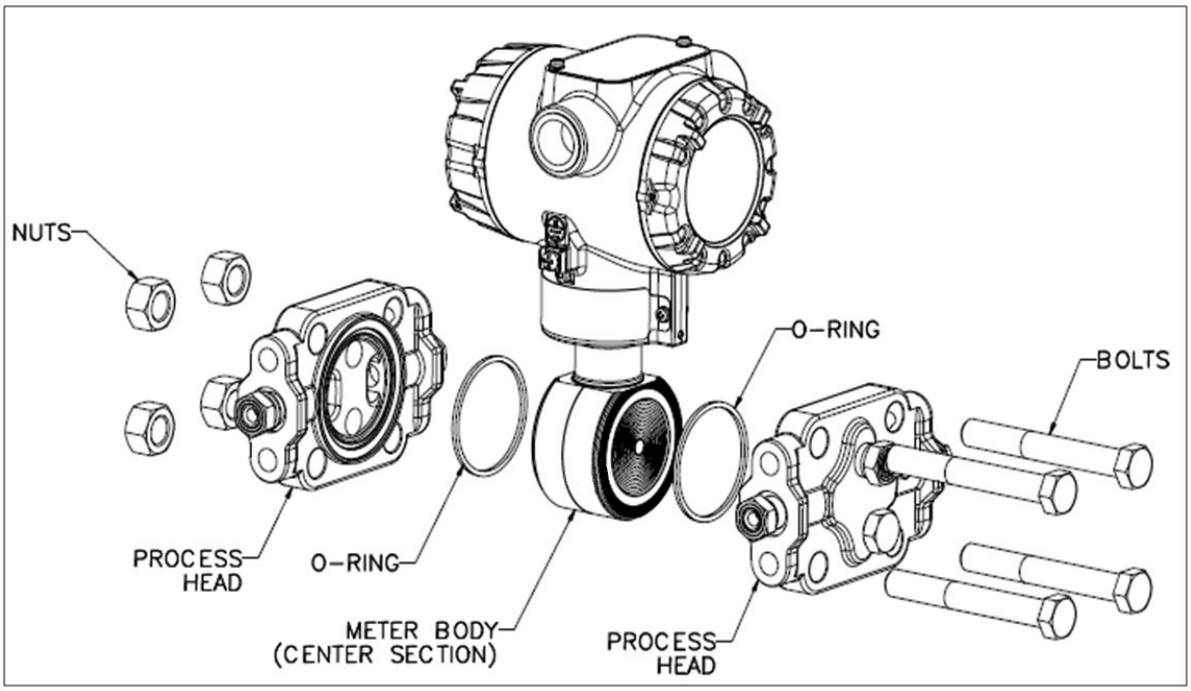


Figure 21 – DP Transmitter Head Disassembly

1. Close all valves to isolate the Transmitter from the process.
2. Open the vent in the process head to drain fluid from the Transmitter meter body, as necessary.
3. Remove the Transmitter from the process.
4. Loosen the nuts in the sequence shown in Figure 22.
5. Remove the nuts from the bolts that hold the process head(s) to the meter body.
6. Remove the process heads and bolts.
7. Remove the gasket/ O-ring, and clean the interior of the process head using a soft bristle brush and an approved solvent.
8. Inspect the barrier diaphragm for signs of deterioration, corrosion, and distortion.
9. If the diaphragm is distorted contact Honeywell for assistance.
10. Install a new gasket/O-ring in each process head.
11. Coat threads on the process head bolts with a suitable anti-seize compound, such as "Neverseize," or equivalent.
12. Using a torque wrench, gradually tighten the nuts in the sequence shown in Figure 22. Tighten head bolts in stages of 1/3-full torque, 2/3-full torque, and full torque. See Table 19 for torque requirements versus Transmitter type and model.

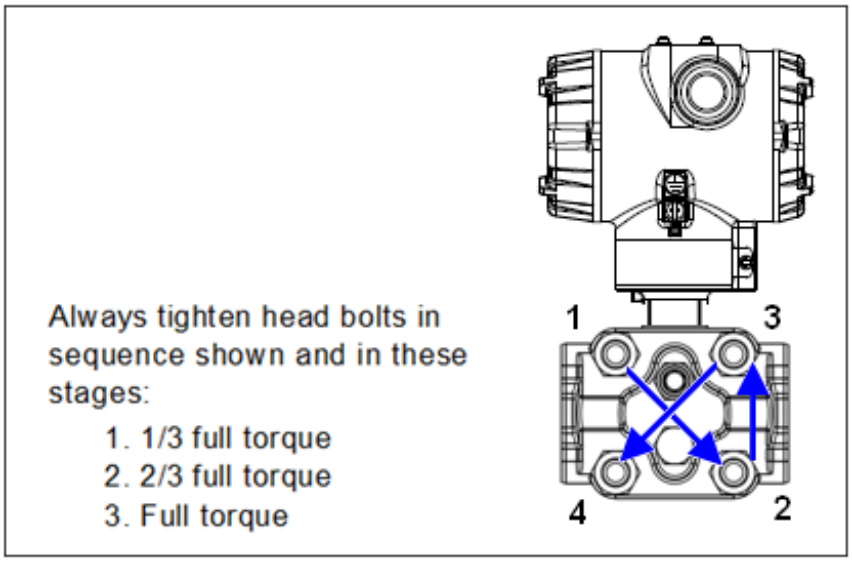


Figure 22 – Head Bolt Tightening Sequence

Table 19 – Head Bolt Torque Values

BOLTING TYPE	B7M BOLTING TABLE III B7 OPTION BOLT 51452557-004 NUT 51452559-003	PTFE COATED B7M BOLTING Y SPECIAL OPTION BOLT 51452557-007 NUT 51452559-007	MONEL K 500 BOLTING Y SPECIAL OPTION BOLT 51452557-005 NUT 51452559-005	25% CHROMIUM SUPER DUPLEX BOLTING Y SPECIAL OPTION BOLT 51452557-006 NUT 51452559-006	316 STAINLESS STEEL BOLTING TABLE III SS OPTION BOLT 51452557-003 NUT 51452557-003 BOLT 51452559-004	NACE CR BOLTING TABLE III CR OPTION BOLT 51452557-002 NUT 51452559-02	ALL GRADE 660 CLASS D BOLTING Y SPECIAL OPTION BOLT 51452557-001 NUT 51452559-008	CARBON STEEL BOLTING STANDARD OPTION BOLT 51452557-001 NUT 51452559-001	ALL GRADE 660 CLASS D BOLTING Y SPECIAL 6 KPSI OPTION BOLT 51452557-202 NUT 51452559-008
50049713XXXX, EXCEPT XXX5 ALL TRANSMITTERS EXCEPT DRAFT RANGE	48,8 N•M +/- 2,4 N•M (36.0 Lb-Ft +/- 1.8 Lb-Ft)				56,9 N•M +/- 2,8 N•M (42.0 Lb-Ft +/- 2.1 Lb-Ft)			67,8 N•M +/- 3,4 N•M (50.0 Lb-Ft +/- 2.5 Lb-Ft)	
50049713XXX5 DRAFT RANGE TRANSMITTER ONLY	20,3 N•M +/- 1,0 N•M (15.0 Lb-Ft +/- 0.8 Lb-Ft)								

5.4 Replacing the Communication Module

The Communication module includes a connector to the sensor ribbon cable and a connector to the optional Display module. This section includes the procedure to replace the Communication module.

The transmitter does not have to be removed from service to replace the Comm Module

Please take appropriate steps to avoid ESD damage when handling the Communication and Display Module assemblies

Refer to Figure 23 for parts locations.

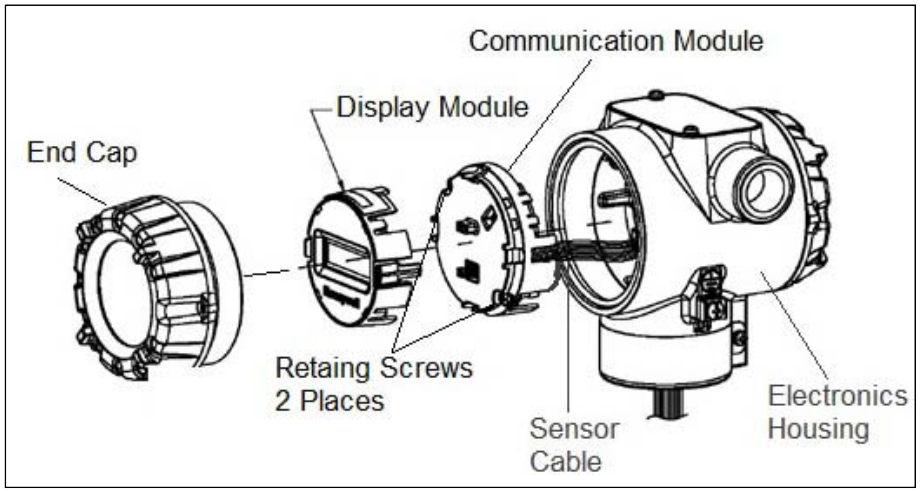


Figure 23 – PWA Replacement

1. Turn OFF Transmitter power (Power removal is only required in accordance with area safety approvals. Power removal is only required in Class 1 Div 1 Explosionproof and Class 1 Div 2 environments).
    - When removing the Communications Module with power applied, the loop will go to 0V. Likewise, installing a Communications Module into a transmitter with power applied will cause the loop output value to go to 12 ma for several seconds then the loop output value will go to the configured value based on the PV input.
    - Installing a Display Module into a powered transmitter may cause a temporary upset to the loop output value.
2. Loosen the end cap lock, and unscrew the end cap from the electronics side of the Transmitter housing.
3. If equipped with a Display module, carefully depress the two tabs on the sides of the Display Module, and pull it off.

4. If necessary, unplug the interface connector from the Communication module. **Do not discard the connector**.

5. Loosen the two retaining screws, and carefully pull the Communication module from the Electronics compartment.

6. Carefully align and connect the Sensor Ribbon Cable to the connector "J4" at the bottom of the Communication module. When installing the Communication module in the next step, be careful not to pinch the Sensor Ribbon Cable.

7. Carefully, insert the Communication module into the Electronics compartment. Ensure that the Sensor Ribbon Cable is not pinched.

8. Tighten the two Communication module retaining screws.

9. Refer to the SmartLine User's Manual to change the FAILSAFE, READ/WRITE, and SIM-OFF/SIM-ON (Fieldbus Only) configuration settings.

10. If applicable, re-install the Display module as follows:

    a) Orient the display as desired.

    b) Install the Interface Connector in the Display module such that it will mate with the socket for the display in the Communication module.

    c) Carefully line up the display, and snap it into place. Verify that the two tabs on the sides of the display latch.

Orient the Display for proper viewing through the end cap window. You can rotate the meter mounting orientation in 90 ^{o} increments.

11. Apply Parker Super O-ring Lubricant or equivalent to the end cap O-ring before installing the end cap. Reinstall the End Cap and tighten the End Cap locking screw.

12. Installing Optional External Configuration Button Assembly.

    a) Loosen (Do Not Remove) both top nameplate screws and pivot nameplate 90°.

    b) Align the protrusion on the button assembly with the matching opening in the housing and snap the button assembly into the housing.

    c) Rotate the nameplate back to the original position, and tighten the nameplate screws.

(Steps 13 - 16 required for Field Upgrades Only)

13. Loosen the End Cap locking screw and unscrew the End Cap from the Field Wiring side of the transmitter housing.

14. Select the proper Communication/External Configuration upgrade kit label from the label strip provided and adhere to the inside of the Field Wiring compartment End Cap.

15. Apply Parker Super O-ring Lubricant or equivalent to the end cap o-ring before installing the end cap. Reinstall the End Cap and tighten the end cap locking screw.

16. Install external upgrade label (i.e. DEVICE MODIFIED…..) provided on outside of housing as shown in Figure 23.

17. Restore power if removed.

18. Check the settings of the Transmitter Setup and Display Setup parameters to make sure that the transmitter is configured correctly for your application. See the User's Manual (ST 800 #34-ST-25-35, ST 700 #34-ST-25-44) for details on HART and DE transmitters. Refer to manual #34-ST-25-39 for additional information about Fieldbus transmitters.

19. If applicable, verify External Button Configuration operation.
    Ready to go.

5.5 Replacing the Meter Body

You can replace the complete meter body, including the process heads, or the meter body only on certain Differential Pressure (DP), Gauge Pressure (GP), and Atmospheric Pressure (AP) Transmitters by using the existing process head(s). Use the following procedure for meter body-only replacement.

1. Save or record device configuration data.
2. Turn off Transmitter power.
3. Remove the Transmitter from service, and move it to a clean area before disassembling it.
4. Refer to Figure 24. Loosen the End Cap Lock, and unscrew the End Cap from the electronics side of the Transmitter housing.

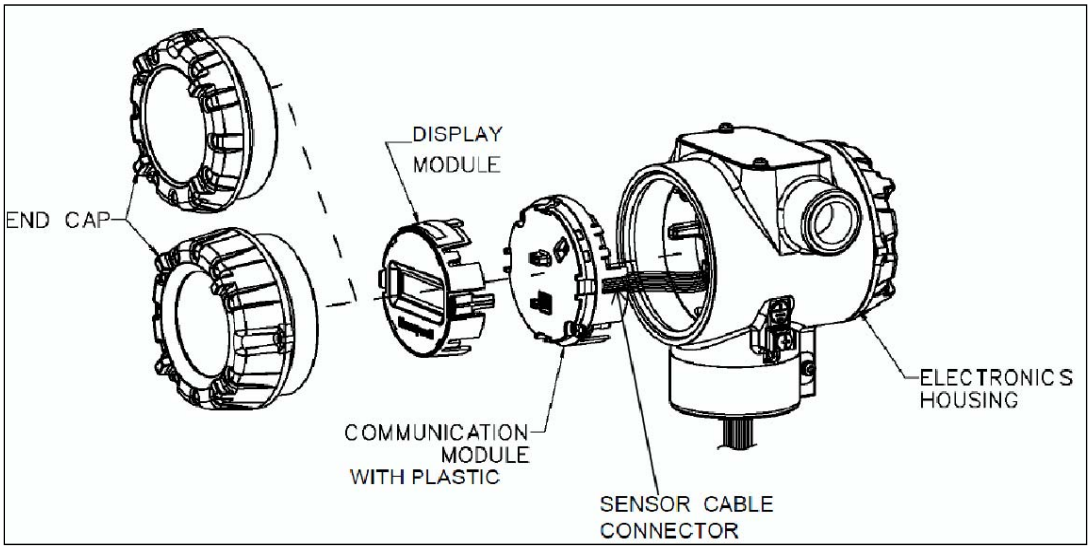


Figure 24 – Disassembly for Meter Body Replacement

Please take appropriate steps to avoid ESD damage when handling the Communication and Display Module assemblies

5. If a display is present, press the two snaps along the side, and remove it from the communication module assembly.
   Note: Do not discard or misplace the Display/Communication connector, it will be required to reassemble the Display Module
6. Loosen the two retaining screws, and remove the Communications Module assembly, and remove the Communication Module assembly from the electronics housing.
7. Disconnect the Sensor Cable from the Communications Board.
8. Refer to Figure 25 . Use a 2 mm hex wrench to completely loosen the set screw on the outside of the housing to permit rotating the meter body.

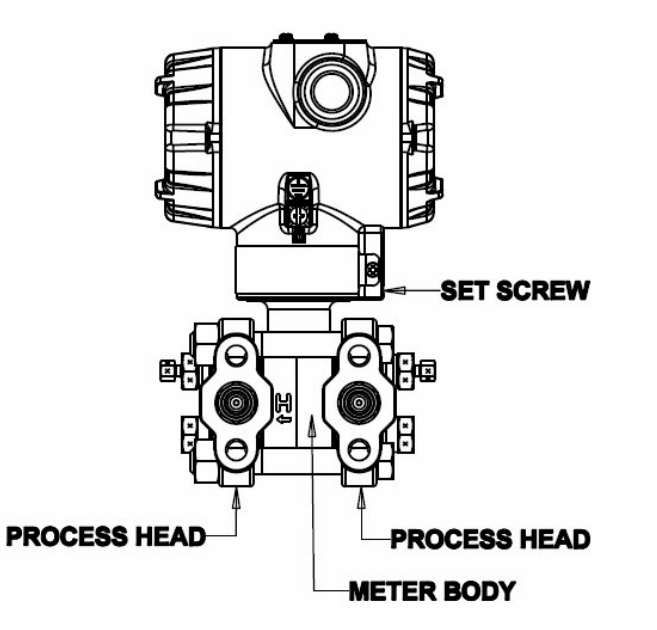


Figure 25 – Hardware Location to Remove the Meter Assembly

9. Carefully turn the complete meter body counterclockwise to unscrew it from the electronics housing.
10. Remove the nuts from bolts that hold the process head(s) to the Meter Body.
11. Remove process heads and bolts.
12. Remove the gaskets or O-rings from the process heads.
13. Clean the interior of the process head(s) with a soft bristle brush and suitable solvent.

CAUTION

To prevent damage to the diaphragm in the Meter Body, use extreme care when handling or placing the Meter Body on any surface. Carefully assemble gaskets or O-rings to the meter body. If installing O-rings, lubricate with water or leave dry.

14. Coat threads on process head bolts with anti-seize compound such as “Neverseize” or equivalent.
15. Refer to . Apply Dow Corning #33 silicone grease to the meter body adapter O-ring and carefully assemble the O-ring to the meter body. Assemble the process head(s) and bolts to the new meter body. For now, make the bolts only finger-tight.

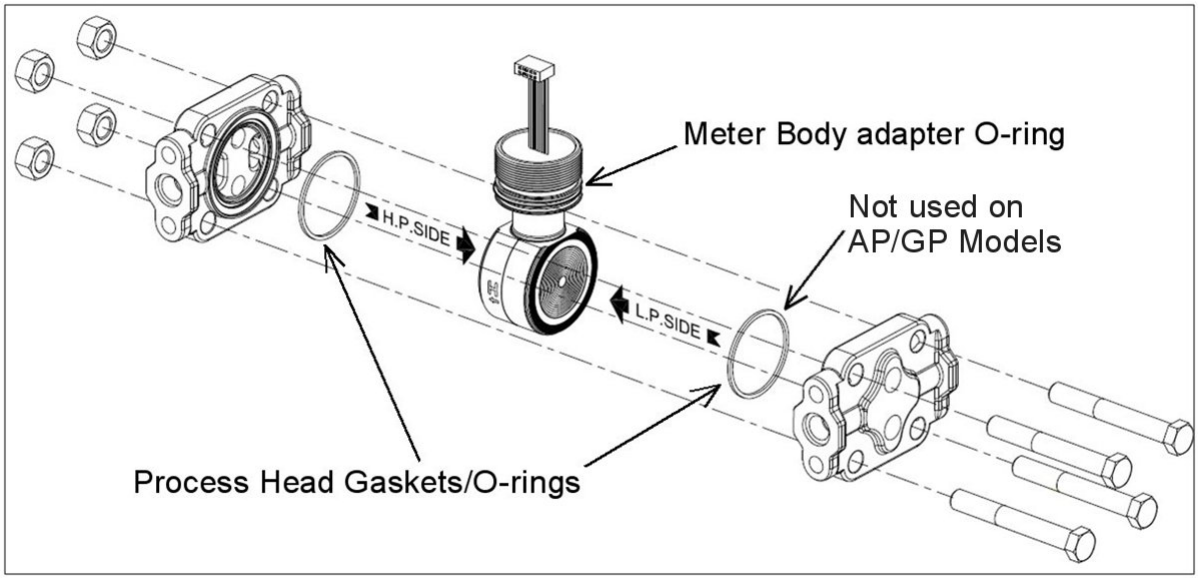


Figure 26 – Meter Body Reassembly

16. Use a torque wrench to gradually tighten nuts to torque rating in sequence shown in Figure 27. Tighten head bolts in stages of 1/3 full torque, 2/3 full torque, and then full torque.

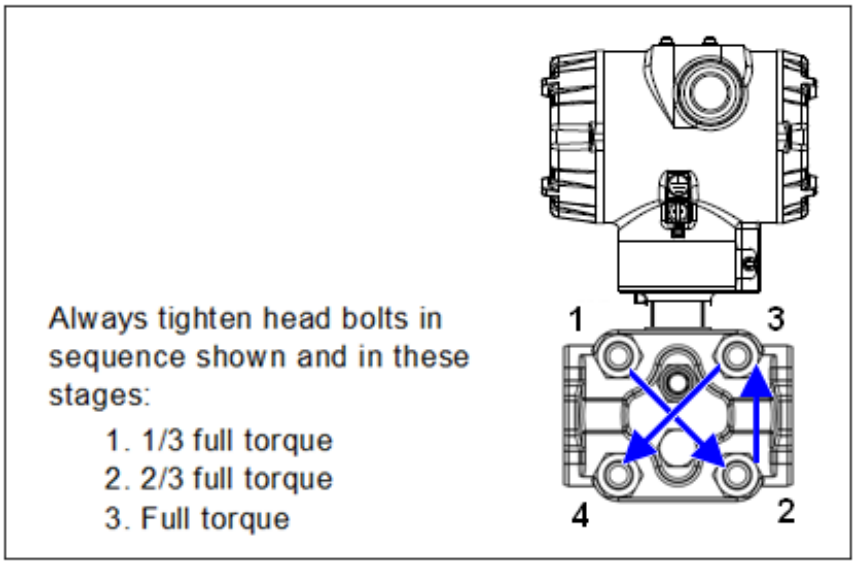


Figure 27 – Head Bolt Tightening Sequence

17. Feed the ribbon cable on the new meter body through the neck of the housing.

CAUTION

To prevent damage to the ribbon cable, use care when assembling the Meter Body to the electronics housing.

18. Screw the new meter body into the housing until the bottom of the Meter Body adapter is flush with the neck of the electronics housing.
19. Tighten the outside set screw to be sure it is fully seated in the slot in the header.
20. Loosen the set screw ½- turn.
21. Rotate the housing to the desired position (Max. 180^{o} in either direction), and tighten the set screw.
22. Carefully align and connect the Sensor Ribbon Cable to connector "J4" at the bottom of the Communication module board. When installing the Communication module in the next step, be careful not to pinch the Sensor Ribbon Cable.
23. Carefully, insert the Communication module into the Electronics compartment. Ensure that the Sensor Ribbon Cable is not pinched.
24. Tighten the two Communication module retaining screws.
25. If applicable, re-install the Display module as follows:

    a) Orient the display as desired.

    b) Install the Interface Connector in the Display module such that it will mate with the socket for the display in the Communication module.

    c) Carefully line up the display, and snap it into place. Verify that the two tabs on the sides of the display latch.

Orient the Display for proper viewing through the end cap window. You can rotate the meter mounting orientation in 90^{o} increments.

26. Connect the bracket to the Transmitter housing.
27. Recalibrate the Transmitter per Section 6 of this document.
28. Return the Transmitter to service, and turn ON power
29. Verify the Transmitter configuration data. Restore the saved database if necessary.
30. Lubricate the end-cap O-ring with Parker Super O-ring silicone lubricant or equivalent before replacing the end caps.

6 Calibration

6.1 Recommendations for Transmitter Calibration

The ST 800 Pressure Transmitter does not require periodic calibration to maintain accuracy. Typically, calibration of a process-connected Transmitter will degrade, rather than augment the capability of a smart Transmitter. For this reason, it is recommended that a Transmitter be removed from service before calibration. Moreover, calibration will be accomplished in a controlled, laboratory-type environment, using certified precision equipment.

6.2 Calibration Procedures

For a Transmitter operating in analog mode, you must calibrate its output signal measurement range using any compatible hand-held communicator or a local display.

One calibration option is to use the Honeywell Smart Field Communicator (SFC). Refer to the *Smart Field Communicator Operating Guide,* 34-ST-11-14 for calibration procedures.

Calibration information and procedures for a Transmitter operating in the HART/DE mode are provided in the *ST 800 Series HART/DE Option User's Manual*, document number 34-25-25-35, Section on "Calibration."

7 Troubleshooting

7.1 Overview

Troubleshooting involves responding to error messages, primarily displayed by the MC Toolkit. Error messages that may occur on the Transmitter's local display are fairly self-explanatory and intuitive. However, this section covers the diagnostic messages that indicate critical conditions. Other than the critical conditions, additional detail is not provided. If you require assistance, contact your distributor or Honeywell Technical Support. All other messages are covered by the MC Toolkit Users' Manual.

7.2 Critical Diagnostics Screens

When a Critical Diagnostic is present in the Transmitter, the Advanced Display will show one or more of the screens pictured in Figure 28. These screens will be inserted into the normal screen rotation and displayed between the user-defined operator screens. A description of the diagnostic conditions is given Table 20, along with suggested actions for resolving the problem.

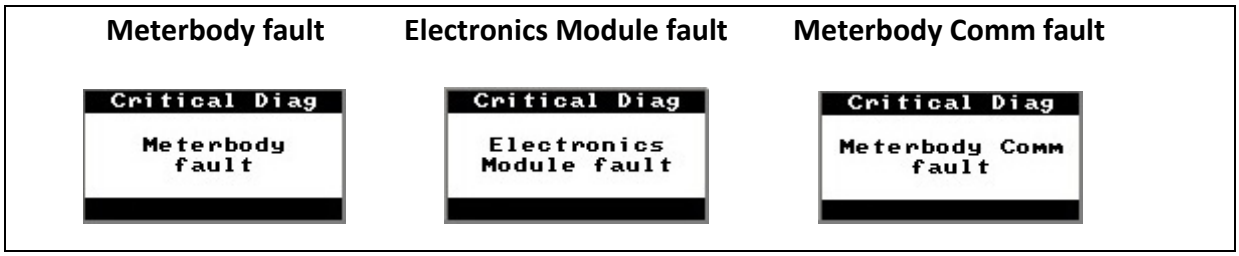


Figure 28 – Local Display Fault Diagnostic Conditions

The Basic Display will display the message CRITCAL FAULT on the top line of the LCD and the appropriate diagnostic text on the lower line.

7.2.1 Fault Conditions and Recommended Corrective Actions

Table 20 – Fault Conditions and Recommended Corrective Actions.

Condtion	Analysis	Recommended Corrective Action
Meterbody fault. A critical failure has been detected in the Meterbody	Use a HART, DE, or FF communicator to read the detailed status information from the transmitter. Refer to the appropriate communicator manual to get more information about the possible causes of the failure.	Cycle power to the Transmitter. If the problem continues to occur, replace the Meterbody.
Electronics Module Fault. A critical failure has been detected on the HART, DE, or FF Electronics Module.	Use a HART, DE, or FF communicator to read the detailed status information from the transmitter. Refer to the appropriate communicator manual for more information about the possible failure causes.	Cycle power to the transmitter. If the problem continues to occur replace the Electronics Module.

Meterbody Comm fault. Communications between the Meterbody and the Electronics Module has failed.	This could be the result of a failure on either of these modules or the cable that connects them. Use a HART, DE, or FF communicator to read the detailed status information from the transmitter. Refer to the appropriate communicator manual to get more information about the possible causes of the failure.	Check the ribbon cable that connects the Meterbody to the Electronics Module. Make sure that the cable is securely plugged into the Electronics Module. Make sure that all pins are plugged into the connector (i.e., make sure that the connector is not offset in a way that leaves some pins unconnected). Cycle power to the transmitter. If the problem continues to occur replace the Electronics Module. If this does not fix the problem, replace the Meterbody.

8 Parts List

8.1 Overview

Individually saleable parts for the various Transmitter models are listed in this section. Some parts are illustrated for identification. Parts are identified and listed in the corresponding tables as follows:

- Individually saleable parts are indicated in each figure by key number callout.
- Parts that are supplied in kits are indicated in each illustration by key number callout with the letter K prefix.

Table 21 is a summarized list of recommended spare parts.

Table 21 – Summary List of Recommended Spare Parts

Part Number	Description	Figure No.	Key No.	1-10 Units	10-100 Units	100-1000 Units
	Electronics Housing Assembly					
50049849-501 50049849-502 50049849-503 50049849-504 50049849-507 50049849-508	HART Electronics Module Without REED Sensor PWA HART Electronics Module With REED Sensor PWA DE Electronics Module Without REED Sensor PWA DE Electronics Module With REED Sensor PWA FieldBus Electronics Module Without REED Sensor PWA FIeldBus Electronics Module With REED Sensor PWA	Figure 30	5	1	1-2	2-4
51452865-201 51452865-202 51452865-203 51462865-204	**Meter Body Seal kit (includes O-rings)** Glass Filled PTFE VITON 100% PTFE GRAPHITE	Figure 33 & Figure 34	K1	1	1-2	2-4
50075472-531 50075472-532 50075472-533 50075472-534	HART/DE Terminal Block Assy Without Lightning Protection HART/DE Terminal Block Assy With Lightning Protection FieldBus Terminal Block Assy Without Lightning Protection FieldBus Terminal Block Assy With Lightning Protection	Figure 31	3	1	1	1-2
	Process head gasket kit	**Figure No.**	**Key No.**	**1-10 Units**	**10-100 Units**	**100-1000 Units**
51452868-501 51452868-502 51452868-507	Gasket only, Process Head (12 PTFE packs) Gasket only, Process Head (6 Viton Head O-Rings) Gasket only, Process Head Graphite Gasket (replacement only for existing graphite gasket)	Figure 33 & Figure 34	K7	12 6 6	12-24 6-12 6-12	24-48 12-24 12-24

	Meter Body	Figure No.	Key No.	1-10 Units	10-100 Units	100-1000 Units
Specify complete number from nameplate	DP Models	Figure 33	1	1	1-2	2-4
	GP/AP HEAD Models	Figure 34	1			
	LGP/LAP Models	Figure 35	1			
	Flush Mount Models	Figure 36	1			
	Flange Mount Models	Figure 37	1			
	Remote Diaphragm Seal Models	Figure 38	1			

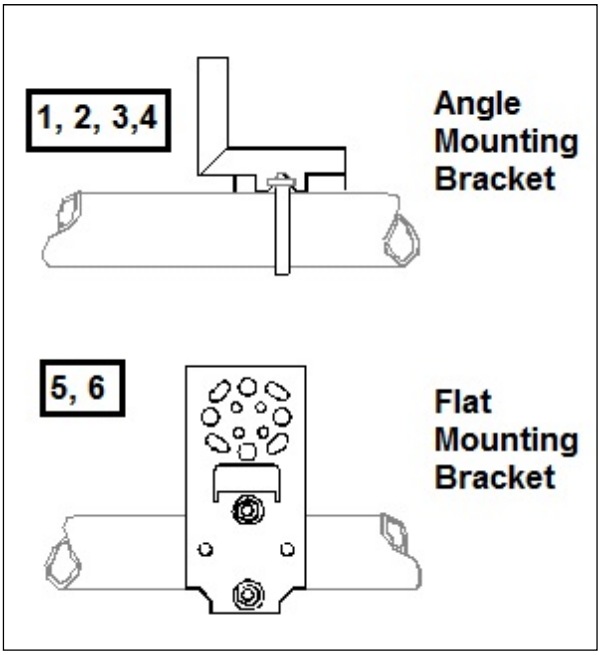


Figure 29 – Angle and Flat Bracket Parts

Table 22 – Angle and Flat Bracket Parts (Refer to Figure 29)

Key No.	Part Number	Description	Quantity Per Unit
1	30752770-103	SS 304 Angle Bracket Mounting kit for all models except In-line and Flush mount transmitters	1
2	30752770-104	SS 304 Angle Bracket Mounting kit for all In-Line and Flush mount transmitters	1
3	30752770-303	Marine Approved Angle Bracket for all models except In-line and Flush mount transmitters	1
4	30752770-304	Marine Approved Angle Bracket for all In-line and Flush mount transmitters	1
5	51196557-005	SS 304 Flat Bracket Mounting kit for all models except In-line and Flush mount transmitters	1
6	51196557-006	SS 304 Flat Bracket Mounting kit for all In-line transmitters and Flush mount transmitters	1
7	30752770-403	SS 316 Flat Bracket Mounting kit for all In-line transmitters except In-Line and Flush mount transmitters	1
8	30752770-404	SS 316 Flat Bracket Mounting kit for all In-Line and Flush mount transmitters	1

9	51196557-008	SS 316 Flat Bracket Mounting kit for all In-line transmitters except In-Line and Flush mount transmitters	1
10	51196557-009	SS 316 Flat Bracket Mounting kit for all In-Line and Flush mount transmitters	1

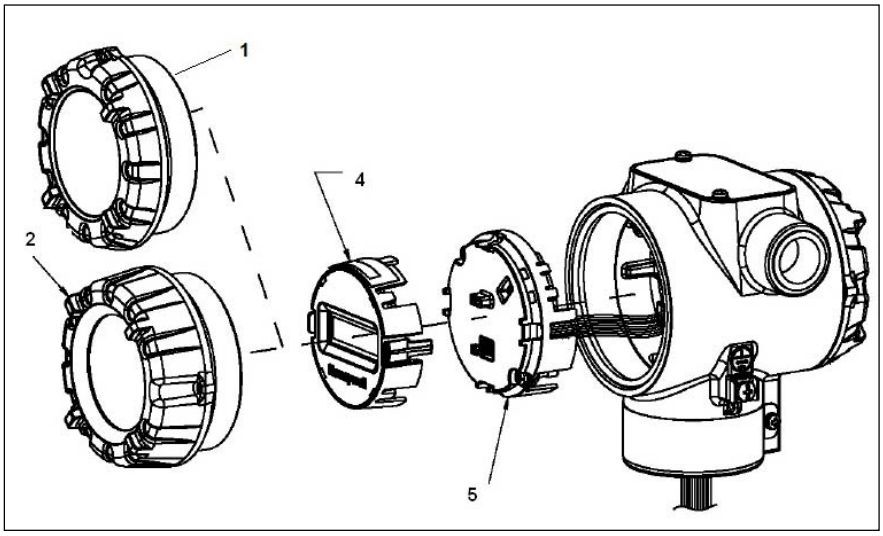


Figure 30 – Electronic Housing, Display End

Table 23 – Transmitter Major Assemblies

(Refer to Figure 31, Figure 32, Figure 33)

Key No.	Part Number	Description	Quantity Per Unit
1	50049858-501 50049858-521	End Cap (Aluminum) End Cap (Stainless Steel)	1
2	50049832-501 50049832-521	End Cap, Display (Aluminum) End Cap, Display (Stainless Steel)	1
3	50075472-531 50075472-532 50075472-533 50075472-534	Terminal Assy HART/DE without Lightning protection Terminal Assy HART/DE with Lightning protection Terminal Assy FF/PB without Lightning protection Terminal Assy FF/PB with Lightning protection	1
4	50049911-501 50049846-501	Basic Display Advanced Display	1
5	50049849-501 50049849-502 50049849-503 50049849-504 50049849-507 50049849-508	HART Electronics Module Assembly (PWA) without Reed sensor HART Electronics Module Assembly (PWA) with Reed sensor DE Electronics Module Assembly (PWA) without Reed sensor DE Electronics Module Assembly (PWA) with Reed sensor FF Electronics Module Assembly (PWA) without Reed sensor FF Electronics Module Assembly (PWA) with Reed sensor	1
6	50049915-501	External Zero, Span & Config Buttons	1
K1	30757503-005	Electronics housing seals kit (includes O-rings)	

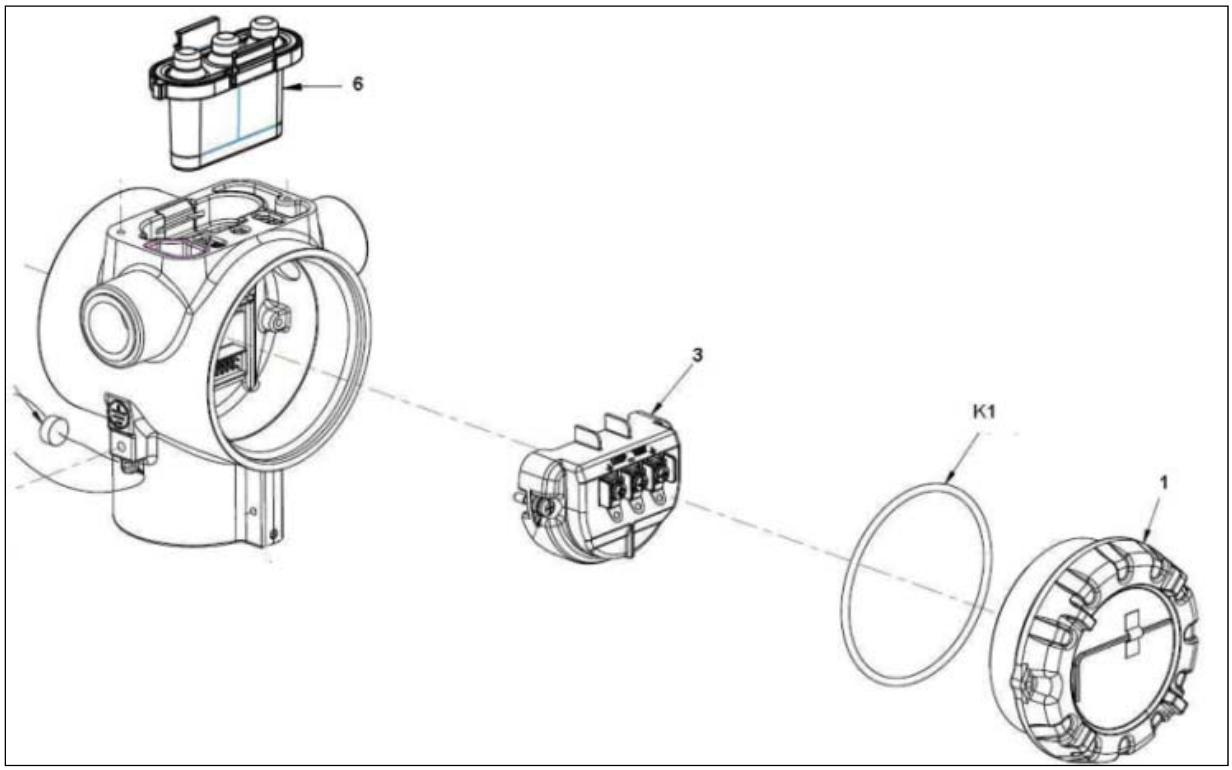


Figure 31 – Electronic Housing, Terminal Block End

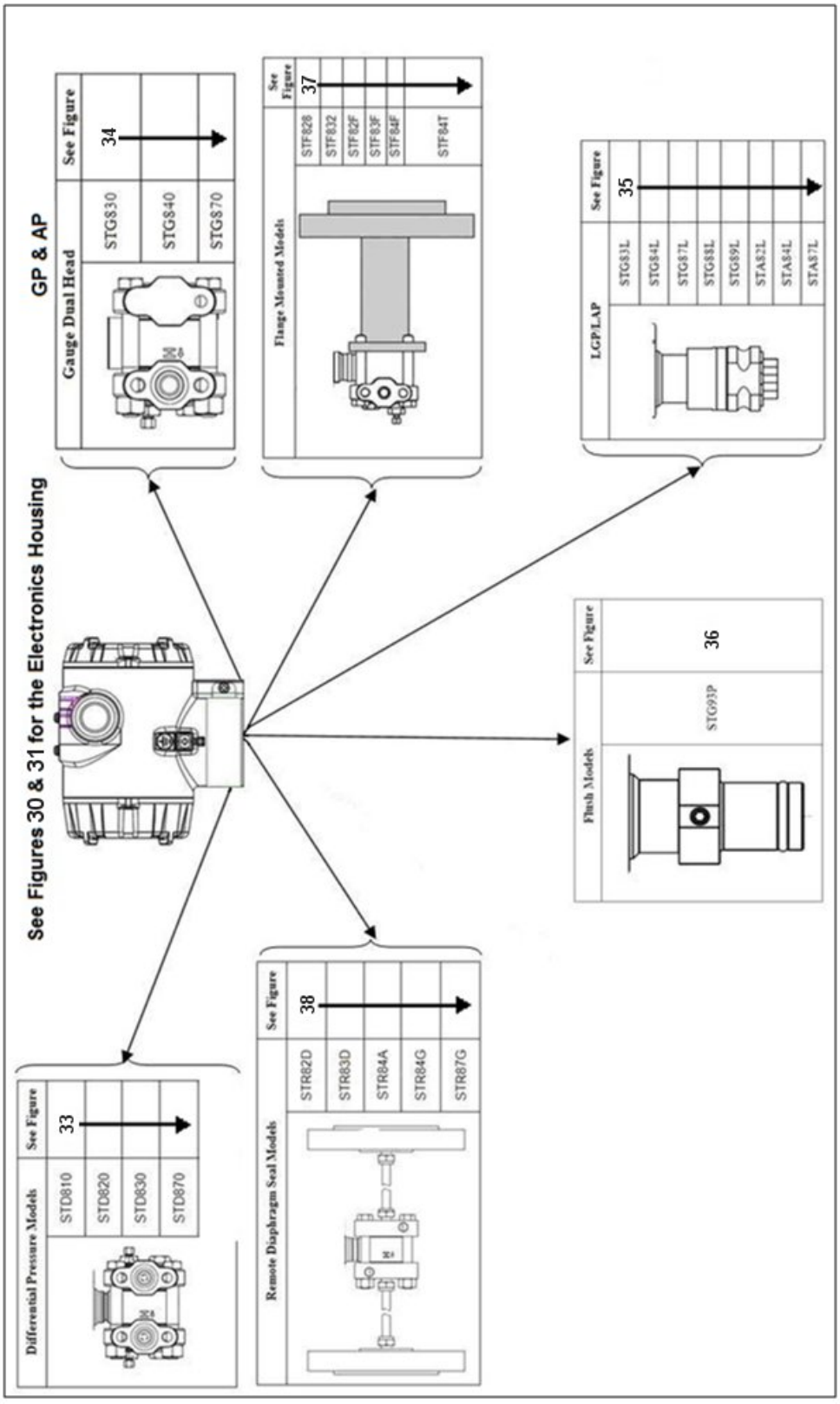


Figure 32 – Transmitter Major Assemblies

Table 24 – ST 800 Models STD810, 820, 830 & 870 (Ref. Figure 33)

Key No.	Part Number	Description	Qty/Unit
		Vent and Plug Kits	
	30753785-001 30753787-001 30753786-001	Drain and Plug Kit, stainless steel Drain and Plug Kit, Monel Drain and Plug Kit, Hastelloy C	
		Each Drain and Plug Kit includes:	
K1		Pipe Plug	4
K2		Vent Plug	2
K3		Vent Bushing	2
		Meter Body Gasket Kits	
	 51452865-201 51452865-202 51452865-203 51452865-204	**Each Meter Body Gasket Kit includes:** Glass Filled PTFE VITON 100% PTFE GRAPHITE	
K6		Gasket, Process Head	6
Ka		Gasket, Flange Adapter	6
K7		O-Ring, Meter Body to Electronics Housing	3
		K7 Process Head Gasket Kits	
K6 K6 K6	51452868-501 51452868-502 51452868-507	Gasket only, Process Head (12 PTFE Gaskets/pack) Gasket only, Process Head (6 Viton Head O-Rings) Gasket only, Process Head Graphite Gasket (use only as replacement of existing graphite gasket)	12 6 6
		Flange Adapter Gasket Kits	
Ka Ka Ka	51452868-504 51452868-505 51452868-508	Gasket only, Flange Adapter, 6 PTFE Adapter Gaskets Gasket only, Flange Adapter, 6 VITON Adapter O-Rings Gasket only, Flange Adapter Graphite Gasket (use only as replacement of existing graphite gasket)	6 6 6
		½-Inch NPT Flange Adapter Kits	
	 51452867-110 51452867-210 51452867-310 51452867-410 51452867-150 51452867-350 51452867-130 51452867-330	<u>Flange Adapter Kit, with</u>: SS Flange Adapters and with carbon steel bolts SS Flange Adapters and with A286 SS (NACE) bolts SS Flange Adapters and with 316 SS (non-NACE) bolts SS Flange Adapters and with B7M alloy steel bolts Monel Flange Adapters and with carbon steel bolts Monel Flange Adapters and with 316 SS (non-NACE) bolts Hastelloy C Flange Adapters and with carbon steel bolts Hastelloy C Flange Adapters and with 316 SS (non-NACE) bolts	
		Each 1/2-inch NPT Flange Adapter Kit includes:	
Ka		Gasket, Flange Adapter	2
Kb		1/2-inch NPT Flange Adapter	2
Kc		Bolt, hex head, 7/16-20 UNF, 1.50 inches long	4

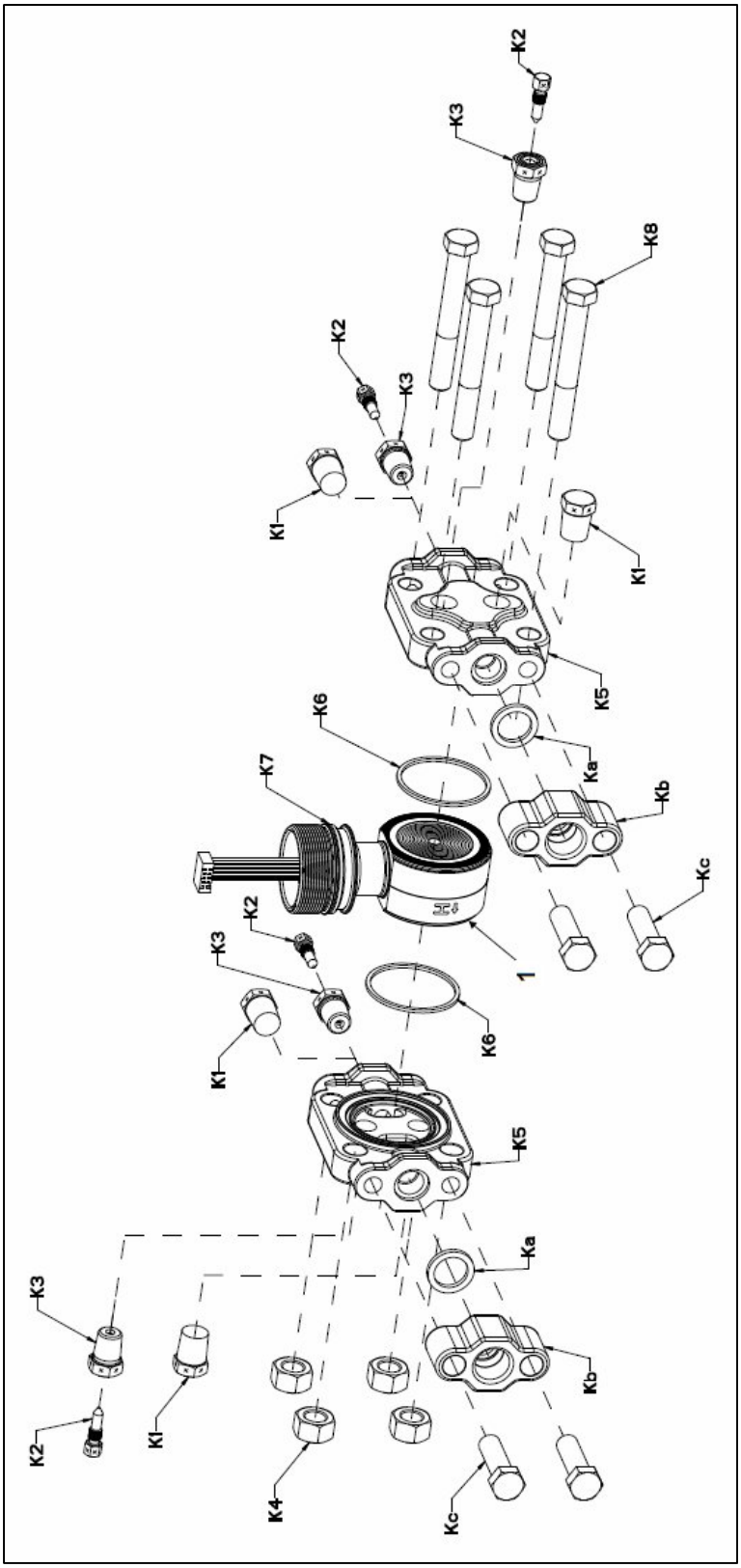


Figure 33 - ST 800 Models STD810, 820, 830, & 870

Table 25 – Parts for STG830, 840, 870 and STA822, 840 Transmitter Body (Ref.)

Key No.	Part Number	Description	Qty/Unit
Process Head Assembly Kits with PTFE Gaskets			
	51452864-010 51452864-012 51452864-020 51452864-022 51452864-030 51452864-032 51452864-040 51452864-042 51452864-050 51452864-052	Carbon steel head (zinc plated) without side vent/drain Carbon steel head (zinc plated) with side vent/drain Stainless steel head without side vent/drain Stainless steel head with side vent/drain Hastelloy C head without side vent/drain Hastelloy C head with side vent/drain Monel head without side vent/drain Monel head with side vent/drain Carbon steel head (nickel plated) without side vent/drain Carbon steel head (nickel plated) with side vent/drain	
Process Head Assembly Kits with PTFE Gaskets			
	51452864-110 51452864-112 51452864-120 51452864-122 51452864-130 51452864-132 51452864-140 51452864-142 51452864-150 51452864-152	Carbon steel head (zinc plated) without side vent/drain Carbon steel head (zinc plated) with side vent/drain Stainless steel head without side vent/drain Stainless steel head with side vent/drain Hastelloy C head without side vent/drain Hastelloy C head with side vent/drain Monel head without side vent/drain Monel head with side vent/drain Carbon steel head (nickel plated) without side vent/drain Carbon steel head (nickel plated) with side vent/drain	
Each process head assembly kit includes:			
K1		Pipe Plug (See notes 1 & 2)	1
K2		Vent Plug (See note 1)	1
K3		Vent Bushing (See note 1.)	1
K5		Process Head	1
K6		Gasket (PTFE), Process Head	1
Ka		Gasket (PTFE), Flange Adapter	1
	Notes		
	Note 1: This item is made of the same material as the Process Heads, except for Kits with carbon steel Process Heads, which include stainless steel Pipe Plug, Vent Plug, and Vent Bushing. Note 2: The Kit for Process Heads without side vent/drain does not include Pipe Plugs (K1).		
Reference Head			
K9 K9	51452951-201 51452951-101	Carbon Steel Blind Reference Head 316 SS Blind Reference Head	1 1

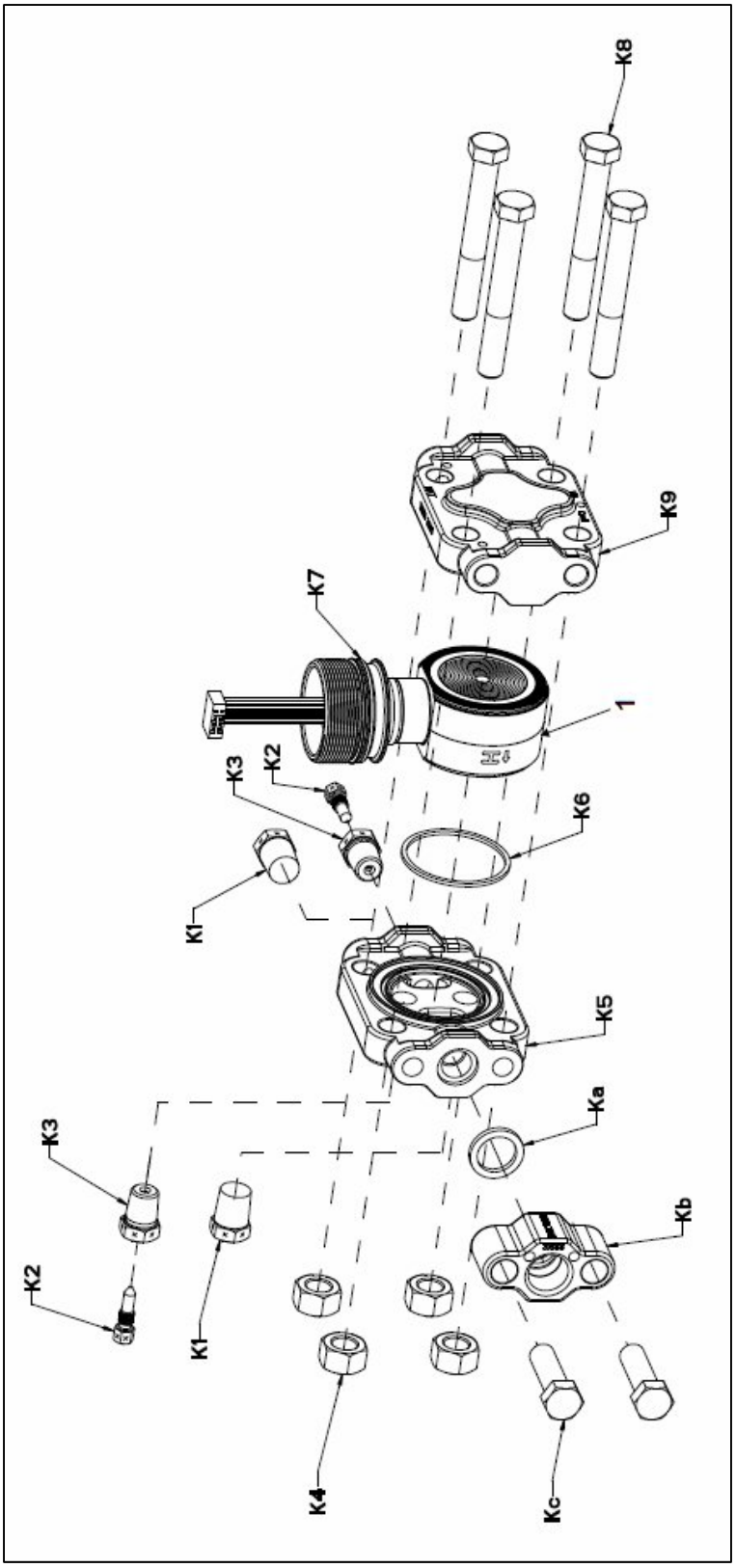


Figure 34 – STG830, 840, 870, and STA822, 840 Transmitter Body

Table 26– Inline Gauge and Inline Atmospheric Meter Body Parts

Key No.	Part Number	Description	Qty/Unit
	Specify complete model number from nameplate	ST Series replacement meter body (LAP/LGP model)	1

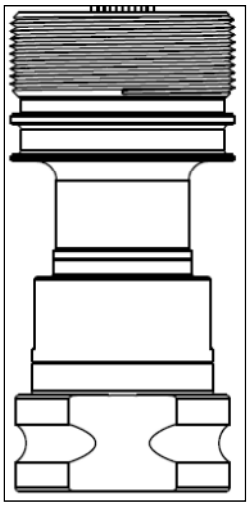


Figure 35 – Inline Gauge and Inline Atmospheric Display Bodies

Table 27 – Flush Mount Meter Body Parts

Key No.	Part Number	Description	Qty/Unit
1	Specify complete model number from nameplate	Replacement meter body (Flush Mount model)	1
	30756445-508	Gasket Kit (0-rings)	
	51204496-001	316L SS Mounting Sleeve Kit	
	51204497-001	Calibration Sleeve Kit	

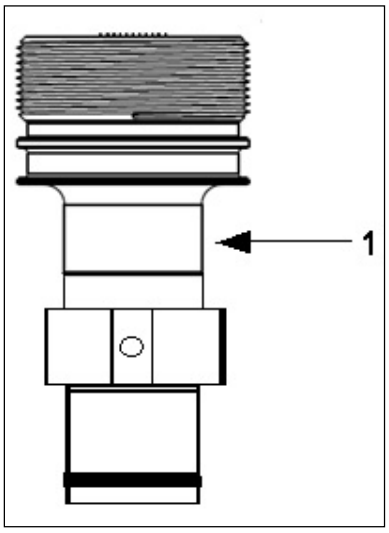


Figure 36 – Flush Mount Meter Body

Table 28 – Flange-Mounted Meter Body Parts (Refer to Figure 37 – Flange Mounted Meter Body

Key No.	Part Number	Description	Qty/Unit
1	Specify complete model number from nameplate	ST Series 800 replacement meter body	1
	30749372-005	O-ring seal	1
	30749372-001	O-ring seal	1
Optional Flange Adapter - Not Shown			
	30754419-006	Flange adapter kit (st. steel flange adapter with carbon steel bolts)	
	30754419-008	Flange adapter kit (Monel flange adapter with carbon steel bolts)	
	30754419-022	Flange adapter kit (st. steel flange adapter with 316 st. steel bolts)	
	30754419-024	Flange adapter kit (Monel with 316 st. steel bolts)	
K1		Bolt, hex head, 7/16-20 UNF, 1.375 inches lg.	2
K2		Flange adapter	1
K3		Gasket	1
K4		Filter screen	1
	30754419-007	Flange adapter kit (Hastelloy C flange adapter with carbon steel bolts)	
	30754419-023	Flange adapter kit (Hastelloy C flange adapter with 316 st. steel bolts)	
K1		Bolt, hex head, 7/16-20 UNF, 1.375 inches lg.	2
K2		Flange adapter	1
K3		Gasket	1
K5	30757503-001	Housing seal kit	1

\

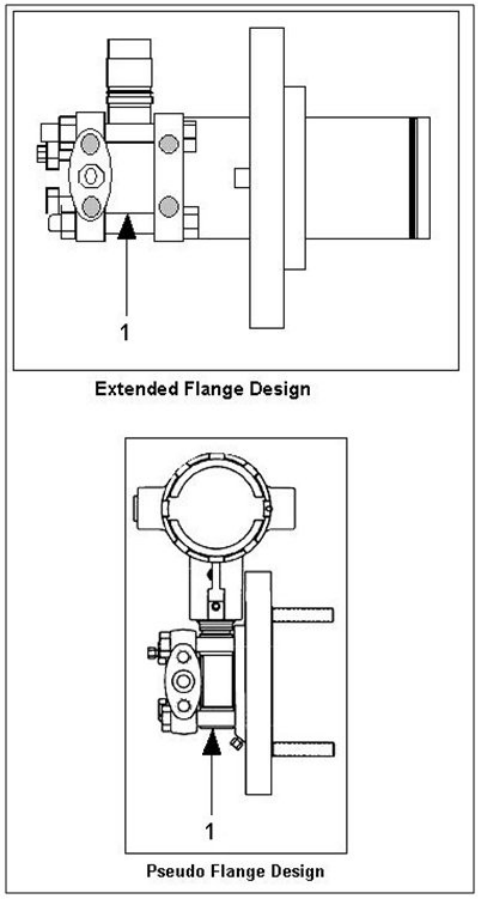


Figure 37 – Flange Mounted Meter Body

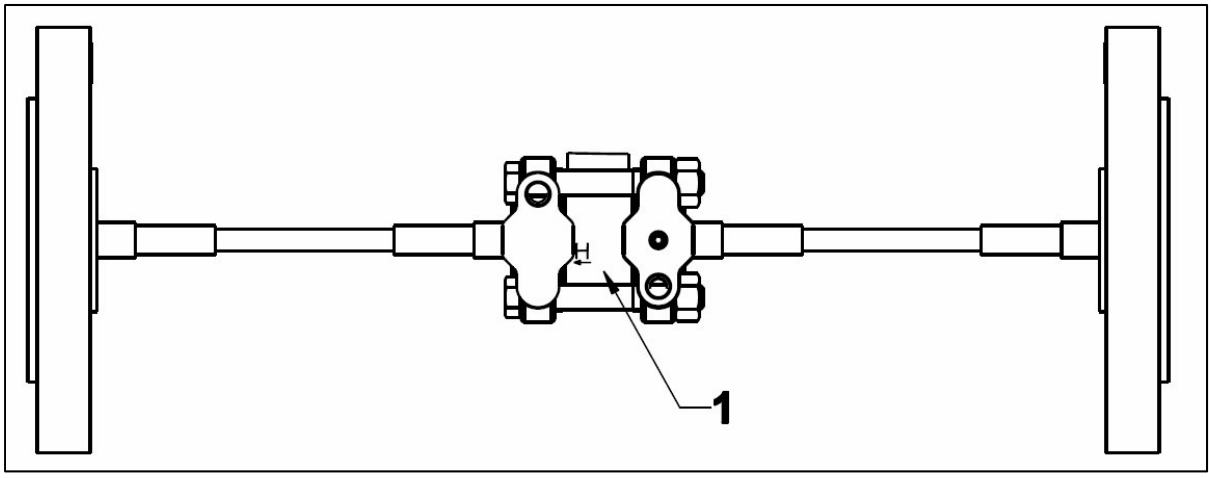


Figure 38 – Remote Seal Diaphragm

Appendix A. PRODUCT CERTIFICATIONS

A1. Safety Instrumented Systems (SIS) Installations

For Safety Certified Installations, please refer to ST 800 & ST 700 Safety Manual 34-ST-25-37 for installation procedure and system requirements.

A2. European Directive Information (CE Mark)

CE Honeywell

50080030 Revision: E

EC DECLARATION OF CONFORMITY

We,

Honeywell International Inc.
Honeywell Field Solutions
512 Virginia Drive
Fort Washington, PA 19034 USA

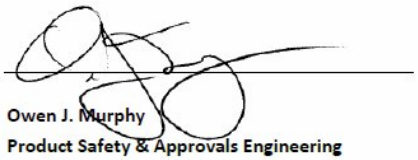
declare under our sole responsibility that the following products,

ST 800 – Smart Series Pressure Transmitter
And
ST 700- Smart Series Pressure Transmitter

to which this declaration relates, is in conformity with the provisions of the European Community Directives, including the latest amendments, as shown in the attached schedule.

Assumption of conformity is based on the application of the harmonized standards and when applicable or required, a European Community notified body certification, as shown in the attached schedule.

The authorized signatory to this declaration, on behalf of the manufacturer, and the Responsible Person is identified below.



Owen J. Murphy
Product Safety & Approvals Engineering
Issue Date: 7 August 2013

Honeywell

SCHEDULE
50080030 Revision: E

Manufacturing Locations:

Honeywell Process Solutions
525 East Market Street
York, PA 17403
USA

Honeywell (Tianjin) Limited
Building 21 of JinBin Development
No. 156, Nan Hai Road, TEDA
Tianjin, 300457
P.R. China

EMC Directive (2004/108/EC)

IEC 61326-1:2005 — Electrical Equipment for Measurement, Control and Laboratory Use – EMC Requirements.

IEC 61326-3-1:2008 — Electrical Equipment for Measurement, Control and Laboratory Use- Part 3-1: Immunity Requirements for safety related systems and equipment intended to perform safety-related functions.

Overview of EMC Testing

Equipment Tested (EUT):	ST 820 TRANSMITTER
Serial No:	993975
Hardware Revision:	Rev A9
Software Revision:	5.0
Reference Document(s):	EMI-EMC Test Plan- STT25 Dated 24 Sept 2010

Summary of Tests Performed:

PORT	TEST	STANDARD	CRITERIA (IEC 61326-1)	CRITERIA (IEC 61326-3-1)	RESULTS
Enclosure	Radiated Emission	CISPR 11	Group1, Class A 30 – 230 MHz: 40 dB 230 – 1000 MHz: 47 dB	Group1, Class A 30 – 230 MHz: 40 dB 230 – 1000 MHz: 47 dB	PASS
	ESD Immunity	IEC61000-4-2	+/- 4KV Contact +/- 8KV Air	+/- 6KV Contact +/- 8KV Air	PASS
	EM Field- RF Radiated Susceptibility	IEC61000-4-3	10 V/m- 80 MHz to 1GHz 3 V/m - 1.4 GHz to 2.0 GHz 1 V/m- 2.0 GHz to 2.7 GHz	20 V/m- 80MHz to 1GHz 10 V/m - 1.4GHz to 2.0 GHz 3 V/m- 2.0GHz to 2.7GHz	PASS PASS PASS
	50Hz/60Hz Magnetic Field Immunity	IEC 6100-4-8	30 A/m	30 A/m	N/A 1
DC Power	EFT(B) Immunity	IEC61000-4-4	+/- 1KV	+/- 2KV	PASS
	Surge Immunity	IEC61000-4-5	+/- 1KV	+/- 2KV	PASS

Honeywell

SCHEDULE
50080030 Revision: E

PORT	TEST	STANDARD	CRITERIA (IEC 61326-1)	CRITERIA (IEC 61326-3-1)	RESULTS
	RF Conducted Susceptibility	IEC61000-4-6	3V	3 V Except the following: 10 V 3.39 to 3.410MHz 10 V 6.765 to 6.795MHz 10 V 13.553 to 13.567MHz 10 V 26.957 to 27.283MHz 10 V 40.66 to 40.70MHz	PASS
I/O Signal/ Control (Including Earth Lines)	EFT(Burst) Immunity	IEC61000-4-4	+/- 1KV	+/- 2KV	2
	Surge Immunity	IEC61000-4-5	+/- 1KV	+/- 2KV	2
	RF Conducted Susceptibility	IEC61000-4-6	3V	3 V Except the following: 10 V 3.39 to 3.410MHz 10 V 6.765 to 6.795MHz 10 V 13.553 to 13.567MHz 10 V 26.957 to 27.283MHz 10 V 40.66 to 40.70MHz	2
AC Power	Voltage Dip	IEC61000-4-11	0% during 1 Cycle 40% during 10-12 Cycles 70% during 25-30 Cycles		N/A[3]
	Short Interruptions	IEC61000-4-11	0% during 250-300 Cycles		N/A[3]
	EFT(Burst) Immunity	IEC61000-4-4	2KV		N/A[3]
	Surge Immunity	IEC61000-4-5	1KV/ 2KV		N/A[3]
	RF Conducted Susceptibility	IEC61000-4-6	3V		N/A[3]

1. There is no magnetic sensitive circuitry.
2. Done as part of the DC Power Testing.
3. Product is DC Powered.

Test Report No : 11948-01

Testing performed at: **Washington Labatories Ltd..**
7560 Lindbergh Drive
Gaithersburg, MD 20879

Honeywell

SCHEDULE
50080030 Revision: E

USA

Test Report No : R-1795P

Testing performed at: **Retlif Testing Labatories**
3131 Detwiler Road
Harleysville, PA 19438
USA

ATEX Directive (94/9/EC)

EC-Type Examination Certificate No: FM12ATEX0029X- **Flameproof "d" Certificate**
EN 60079-0: 2009 EN 60079-1: 2007 EN 60079-26: 2007
EN 60079-31: 2009 EN 60529: 1991 + A1:2000

EC-Type Examination Certificate No: Sira12ATEX2233X- **Intrinsically Safe "ia" Certificate**
IEC 60079-0: 2011 IEC 60079-11: 2011 EN 60079-26: 2006

Type Examination Certificate No: Sira12ATEX4234X **Non Sparking "n" Certificate**
IEC 60079-0: 2011 EN 60079-15: 2010

ATEX Notified Body for EC Type Certificates
FM Approvals Ltd. [Notified Body Number: 1725]
1 Windsor Dials,
Windsor, Berkshire, SL4 1RS
England

Sira Certifcation Service [Notified Body Number: 0518]
Rake Lane
Eccleston, Chester CH4 9JN
England

ATEX Notified Body for Quality Assurance
DEKRA Certification B.V. [Notified Body Number: 0344]
Utrechtseweg 310
6802 ED Arnhem
The Netherlands

Pressure Equipment Directive (PED) (97/23/EC)

Absolute Pressure, Gauge Pressure and Differential Pressure Transmitters
Sound Engineering Practice (SEP)

Remote Seal Seals and Flange Mounted Transmitter
Sound engineering Practice (SEP)

4 of 4

A3. Hazardous Locations Certifications

AGENCY	TYPE OF PROTECTION	COMM. OPTION	FIELD PARAMETERS	AMBIENT TEMP (Ta)
FM Approvals™ USA	**Explosion proof:** Class I, Division 1, Groups A, B, C, D; **Dust Ignition Proof:** Class II, III, Division 1, Groups E, F, G; T4 Class 1, Zone 1/2, AEx d IIC T4 Class 2, Zone 21, AEx tb IIIC T 95°C IP 66	4-20 mA / DE/ HART	Note 1	-50ºC to 85ºC
	Standards: FM 3600:2011; ANSI/ ISA 60079-0: 2009 FM 3615:2006; ANSI/ ISA 60079-1 : 2009 FM 3616 : 2011 ; ANSI/ ISA 60079-31 : 2009 FM 3810 : 2005 ; ANSI/ ISA 60079-26 : 2008 NEMA 250 : 2003 ; ANSI/ IEC 60529 : 2004			
	Intrinsically Safe: Class I, II, III, Division 1, Groups A, B, C, D, E, F, G; T4 Class I Zone 0 AEx ia IIC T4 Ex ia IIC T4	4-20 mA / DE/ HART	Note 2	-50 ºC to 70ºC
	Standards: FM 3600:2011; ANSI/ ISA 60079-0: 2009 FM 3610:2010; ANSI/ ISA 60079-11 : 2011 FM 3810 : 2005 ; ANSI/ ISA 60079-26 : 2008 NEMA 250 : 2003 ; ANSI/ IEC 60529 : 2004			
	Class I, Division 2, Groups A, B, C, D; T4 Class I Zone 2 AEx nA IIC T4 Ex nA IIC T4	4-20 mA / DE/ HART	Note 1	-50 ºC to 85ºC
	Standards: FM 3600:2011; ANSI/ ISA 60079-0: 2009 FM 3611:2004; ANSI/ ISA 60079-15 : 2009 ; FM 3810 : 2005 ; NEMA 250 : 2003 ; ANSI/ IEC 60529 : 2004			
	Enclosure: Type 4X/ IP66/ IP67	All	All	All
CSA US and Canada	**Intrinsically Safe:** Class I, II, III, Division 1, Groups A, B, C, D, E, F, G; T4 Class I Zone 0 AEx ia IIC T4 Ex ia IIC T4	4-20 mA / DE/ HART	Note 2	-50 ºC to 70ºC
	Class I, Division 2, Groups A, B, C, D; T4 Class I Zone 2 AEx nA IIC T4 Ex nA IIC T4	4-20 mA / DE/ HART	Note 1	-50 ºC to 85ºC
	Enclosure: Type 4X/ IP66/ IP67	All	All	All
	Standards: ANSI/ ISA 60079-0: 2009 ; CAN/ CSA-C22.2 No. 0-M91:2006; CAN/ CSA-E60079-0:2002 ; ANSI/ UL 913 : 2010 ; ANSI/ ISA 60079-11 : 2009 ; CAN/ CSA-C22.2 No.157-92: 1992; CAN/CSA-E 60079-11: 2002; ANSI/ ISA 60079-26 : 2008 ANSI/ ISA 12.12.01 : 2007 ; ANSI/ ISA 60079-15 : 2009 ; C22.2 No. 213-M1987; CAN/CSA-E60079-15: 2002 ANSI/ UL 50 : 2007 ; ANSI/ IEC 60529 : 2004			

ATEX- FM	**FM12ATEX0029X** **Flameproof:** II 1/2 G Ex d IIC T4 II 2 D Ex tb IIIC T 85°C IP 66	All	Note 1	-50 ºC to 85ºC
	Enclosure: IP66/ IP67	All	All	All
	Standards: EN 60079-0: 2011 EN 60079-1 : 2007 EN 60079-31 : 2009 EN 60079-26 : 2007 EN 60529 : 2000 + A1			
ATEX- SIRA	**Sira12ATEX2233X** **Intrinsically Safe:** II 1 G Ex ia IIC T4	4-20 mA / DE/ HART/ FF	Note 2	-50 ºC to 70ºC
	Sira12ATEX4234X **Nonincendive:** II 3 G Ex nA IIC T4	4-20 mA / DE/ HART/	Note 1	-50 ºC to 85ºC
	Enclosure: IP66/ IP67	All	All	All
	Standards: EN 60079-0: 2011 EN 60079-11 : 2011 EN 60079-26 : 2006 EN 60079-15 : 2007 IEC 60529 : 2009 with Corr 3			
IECEx- FM	**Flameproof :** Ga/Gb Ex d IIC T4 Ex tb IIIC T 85°C IP 66	All	Note 1	-50 ºC to 85ºC
	Enclosure: IP66/ IP67	All	All	All
	Standards: **IEC** 60079-0: 2011 IEC 60079-1 : 2007 IEC 60079-31 : 2008 IEC 60079-26 : 2006 IEC 60529 : 2009 with Corr 3			
IECEx- CSA	**Intrinsically Safe:** Ex ia IIC T4 Ex ta IIIC T 85°C IP 66	4-20 mA / DE/ HART/ FF	Note 2	-50 ºC to 70ºC
	Nonincendive: Ex nA IIC T4	4-20 mA / DE/ HART/	Note 1	-50 ºC to 85ºC
	Enclosure: IP66/ IP67	All	All	All
	Standards: **IEC** 60079-0: 2011 IEC 60079-11 : 2011 IEC 60079-26 : 2006 IEC 60079-15 : 2011 IEC 60529 : 2009 with Corr 3			

INMETRO (Brazil)	**Flameproof**: Ex d IIC Ga/Gb T4 Ex tb IIIC Db T 85oC IP 66	All	Note 1	T5 Ta = –50 ºC to 85ºC
	Intrinsically Safe: Ex ia IIC Ga T4	4-20 mA / DE/ HART/ FF	Note 2	T4 Ta = –50 ºC to 70ºC
	Nonincendive: Ex nA IIC Gc T4	4-20 mA / DE/ HART/ FF	Note 1	-50 ºC to 85ºC
	Enclosure: IP66/ IP67	All	All	All
SAEx (South Africa)	**Flameproof**: Ex d IIC Ga/Gb T4 Ex tb IIIC Db T 85°C IP 66	All	Note 1	-50 ºC to 85ºC
	Intrinsically Safe: Ex ia IIC Ga T4	4-20 mA / DE/ HART/ FF	Note 2	-50 ºC to 70ºC
	Nonincendive: Ex nA IIC Gc T4	4-20 mA / DE/ HART/ FF	Note 1	-50 ºC to 85ºC
	Enclosure: IP66/ IP67	All	All	All
NEPSI (China)	**Flameproof**: Ex d IIC Ga/Gb T4 Ex tb IIIC Db T 85°C IP 66	All	Note 1	-50 ºC to 85ºC
	Intrinsically Safe: Ex ia IIC Ga T4	4-20 mA / DE/ HART/ FF	Note 2	-50 ºC to 70ºC
	Nonincendive: Ex nA IIC Gc T4	4-20 mA / DE/ HART/ FF	Note 1	-50 ºC to 85ºC
	Enclosure : IP 66/67	All	All	All

Notes

1. Operating Parameters:

(Loop Terminal)

Voltage= 11 to 42 V Current= 4-20 mA Normal (3.8 – 23 mA Faults)

2. Intrinsically Safe Entity Parameters

For details see Control Drawing on page 82.

A4. Marking ATEX Directive

General:

The following information is provided as part of the labeling of the transmitter:

- Name and Address of the manufacturer
- Notified Body identification: DEKRA Quality B.V., Arnhem, the Netherlands

- For complete model number, see the Model Selection Guide for the particular model of pressure transmitter.
- The serial number of the transmitter is located on the Meter Body data-plate. The first two digits of the serial number identify the year (02) and the second two digits identify the week of the year (23); for example, 0223xxxxxxxx indicates that the product was manufactured in 2002, in the 23 rd week.

Apparatus Marked with Multiple Types of Protection

The user must determine the type of protection required for installation the equipment. The user shall then check the box [☐] adjacent to the type of protection used on the equipment certification nameplate. Once a type of protection has been checked on the nameplate, the equipment shall not then be reinstalled using any of the other certification types.

WARNINGS and Cautions:

Intrinsically Safe and Non-Incendive Equipment:

WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR USE IN HAZARDOUS LOCATIONS.

Explosion-Proof/ Flameproof:

WARNING: DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE MAY BE PRESENT

Non-Incendive Equipment:

WARNING: DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE MAYBE PRESENT

All Protective Measures:

WARNING: FOR CONNECTION IN AMBIENTS ABOVE 60^{o}C USE WIRE RATED 105^{o}C

A.5 Conditions of Use" for Ex Equipment", Hazardous Location Equipment or "Schedule of Limitations":

Consult the manufacturer for dimensional information on the flameproof joints for repair.

Painted surface of the ST800 may store electrostatic charge and become a source of ignition in applications with a low relative humidity less than approximately30% relative humidity where the painted surface is relatively free of surface contamination such as dirt, dust or oil. Cleaning of the painted surface should only be done with a damp cloth.

Flame-proof Installations: The Transmitter can installed in the boundary wall between an area of EPL Ga/ Class I Zone 0/ Category 1 and the less hazardous area, EPL Gb/ Class I Zone 1/ Category 2. In this configuration, the process connection is installed in EPL Ga/ Class I Zone 0/ Category 1, while the transmitter housing is located in EPL Gb/ Class I Zone 1/ Category 2.
Intrinsically Safe: Must be Installed per drawing 50049892
Division 2: This equipment is suitable for use in a Class I, Division 2, Groups A, B, C, D; T4 or Non-Hazardous Locations Only.

The enclosure is manufactured from low copper aluminium alloy. In rare cases, ignition sources due to impact and friction sparks could occur. This shall be considered during Installation, particularly if equipment is installed a Zone 0 location.

If a charge-generating mechanism is present, the exposed metallic part on the enclosure is capable of storing a level of electrostatic that could become incendive for IIC gases. Therefore, the user/ installer shall implement precautions to prevent the build up of electrostatic charge, e.g. earthing the metallic part. This is particularly important if equipment is installed a Zone 0 location.

A.6 Control Drawing

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PRE REL		
ISS	REVISION & DATE	APPD
D	5/20/13 ECO-0094776	OJM

ST 800/ ST 700 Series Pressure, ANALOG, HART/DE and FF/ PA Communications

1. Intrinsically safe installation shall be in accordance with
   a. FM (USA): ANSI/NFPA 70, NEC® Articles 504 and 505.
   b. CSA (Canada): Canadian Electrical Code (CEC), part I, section 18.
   c. ATEX: Requirements of EN 60079-14, 12.3 (See also 5.2.4).
   d. IECEx: Requirements of IEC 60079-14, 12.3 (See also 5.2.4).
2. ENTITY approved equipment shall be installed in accordance with the manufacturer's Intrinsic Safety Control Drawing.
3. The Intrinsic Safety ENTITY concept allows the interconnection of two ENTITY Approved Intrinsically safe devices with ENTITY parameters not specifically examined in combination as a system when:
   Uo, Voc, or Vt ≤ Ui or Vmax; Io, Isc, or It ≤ Ii or Imax; Ca or Co ≥ Ci + Ccable, La or Lo ≥ Li + Lcable, Po ≤ Pi.
   Where two separate barrier channels are required, one dual-channel or two single-channel barriers may be used, where in either case, both channels have been Certified for use together with combined entity parameters that meet the above equations.
4. System Entity Parameters:
   ST 800/ ST 700 Transmitter: Vmax Voc or Uo, Imax Isc or Io;
   ST 800/ ST 700 Transmitter: Ci + Ccable ≤ Control Apparatus Ca,
   ST 800/ ST 700 Transmitter: Li + Lcable ≤ Control Apparatus La.
5. When the electrical parameters of the cable are unknown, the following values may be used:
   Capacitance: 197pF/m (60 pF/ft)
   Inductance: 0.66µH/m (0.020µH/ft).
6. Control equipment that is connected to Associated Equipment must not use or generate more than 250 V.
7. Associated equipment must be FM, CSA ATEX or IECEx (depending on location) listed. Associated equipment may be installed in a Class I, Division 2 or Zone 2 Hazardous (Classified) location if so approved.
8. Non-Galvanically isolated equipment (grounded Zener Barriers) must be connected to a suitable ground electrode per:
   a. FM (USA): NFPA 70, Article 504 and 505. The resistance of the ground path must be less than 1.0 ohm.
   b. CSA (Canada): Canadian Electrical Code (CEC), part I, section 10.
   c. ATEX: Requirements of EN 60079-14, 12.2.4.
   d. IECEx: Requirements of IEC 60079-14, 12.2.4.
9. Intrinsically Safe DIVISION 1/ Zone 0 WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR USE IN HAZARDOUS LOCATIONS.
10. Division 2/ Zone 2: WARNING: DO NOT OPEN WHEN AN EXPLOSIVE GAS ATMOSPHERE IS PRESENT.
11. NO REVISION OF THIS CONTROL DRAWING IS PERMITTED WITHOUT AUTHORIZATION FROM THE AGENCIES listed.
12. For release approvals see ECO # 0094464.

	DRAWN		
	CHECKED		
	DEV ENG		
	MFG ENG		
	QA ENG		
	TOLERANCE UNLESS NOTED		
MASTER FILE TYPE: MS WORD	ANGULAR DIMENSION		

Honeywell

CONTROL DRAWING
ST 800/ ST 700 SERIES PRESSURE TRANSMITTER
DIVISIONS 1 & 2 / ZONE 0 & 2

A/A4 — **50049892**

SCALE: None	USED ON	SH. 1 OF 3

HART/DE

ENTITY PARAMETERS	Associated Apparatus
Ui or Vmax ≤ 30V	Uo, Voc or Vt ≤ 30V
Ii or Imax ≤ 105 mA	Io (Isc or It) ≤ 105 mA
Pi or Pmax = 0.9W	Po ≤ 0.9 W
Ci= 3.9 nF	Ca or Co ≥ C_{cable} + $C_{ST\ 800/\ ST\ 700}$
Li= 984 µH	La or Lo ≥ L_{cable} + $L_{ST\ 800/\ ST\ 700}$

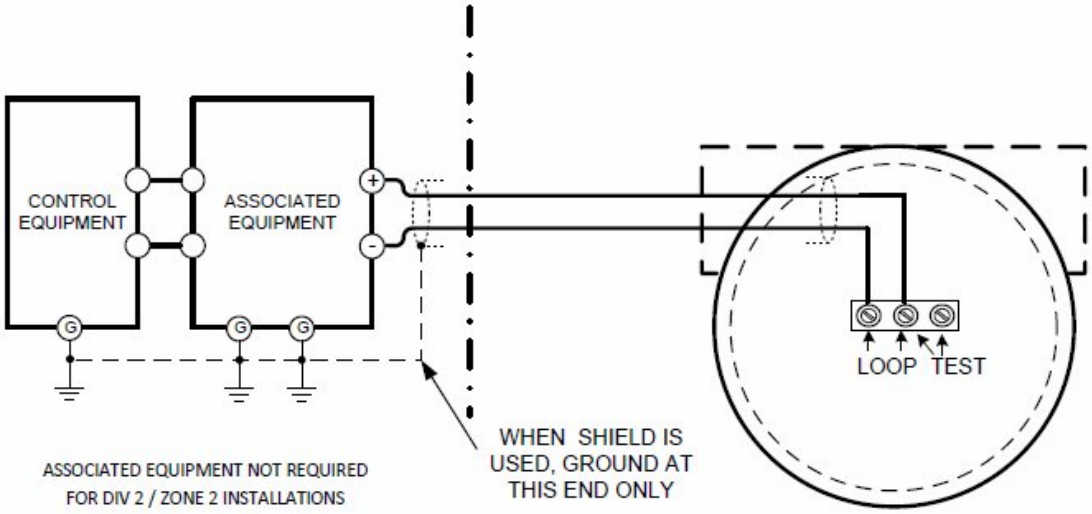
After 9/27/2013

ENTITY PARAMETERS	Associated Apparatus
Ui or Vmax ≤ 30V	Uo, Voc or Vt ≤ 30V
Ii or Imax ≤ 225 mA	Io (Isc or It) ≤ 225 mA
Pi or Pmax = 0.9W	Po ≤ 0.9 W
Ci= 3.9 nF	Ca or Co ≥ C_{cable} + $C_{ST\ 800/\ ST\ 700}$
Li= 0 µH	La or Lo ≥ L_{cable} + $L_{ST\ 800/\ ST\ 700}$

NON-HAZARDOUS LOCATION

HAZARDOUS (CLASSIFIED) LOCATION

CLASS I, DIVISION 1, GROUPS A, B, C, D, E, F & G;
ZONE 0 IIC & ZONE 2 IIC,
CLASS I DIVISION 2, GROUPS A, B, C, D;



ASSOCIATED EQUIPMENT NOT REQUIRED FOR DIV 2 / ZONE 2 INSTALLATIONS

CONTROL EQUIPMENT PARAMETERS WHEN NO ASSOCIATED EQUIPMENT
Umax = Ui = 42V, 4-20 mA, Po ≤ 1 W

Honeywell	A/A4	50049892	
	SCALE: None	REV D DATE 04/20/13	SH. 2 of 3

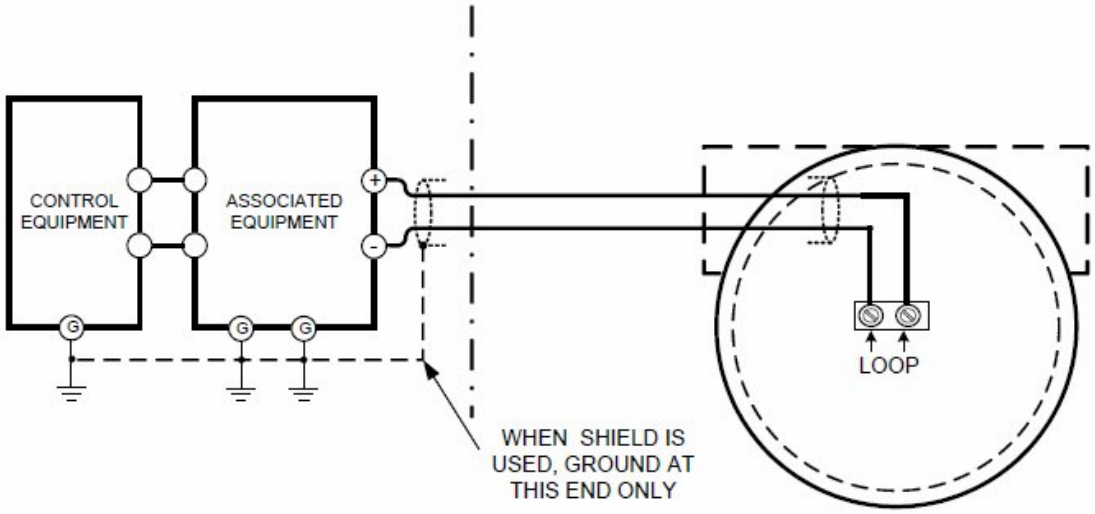
Foundation Fieldbus/ PROFIBUS

ENTITY PARAMETERS	Associated Apparatus
Ui or Vmax ≤ 30V	Uo, Voc or Vt ≤ 30V
Ii or Imax ≤ 180 mA	Io (Isc or It) ≤ 180 mA
Pi or Pmax = 1W	Po ≤ 1 W
Ci= 0 nF	Ca or Co ≥ C_{cable} + $C_{ST\ 800/\ ST\ 700}$
Li= 984 µH	La or Lo ≥ L_{cable} + $L_{ST\ 800/\ ST\ 700}$

NON-HAZARDOUS LOCATION

HAZARDOUS (CLASSIFIED) LOCATION

CLASS I, CLASS II, DIVISION 1, GROUPS A, B, C, D, E, F & G;
ZONE 0 IIC & ZONE 2 IIC,
CLASS I DIVISION 2, GROUPS A, B, C, D;



ASSOCIATED EQUIPMENT NOT REQUIRED
FOR DIV 2 / ZONE 2 INSTALLATIONS

CONTROL EQUIPMENT PARAMETERS
WHEN NO ASSOCIATED EQUIPMENT
Umax=Ui= 32V, 25 mA, Po ≤ 1 W

Honeywell	A/A4	50049892	
	SCALE: None	REV D DATE 04/20/13	SH. 3 of 3

Glossary

AP	Absolute Pressure
AWG	American Wire Gauge
DE	Digital Enhanced Communications Mode
DP	Differential Pressure
d1	Inside diameter of pipe
d2	Orifice plate bore diameter at flowing temperature
do	Inside diameter of orifice
EMI	Electromagnetic Interference
FTA	Field Termination Assembly
GP	Gauge Pressure
HP	High Pressure (also, High Pressure side of a Differential Pressure Transmitter)
Hz	Hertz
inH_2O	Inches of Water
LGP	In-Line Gauge Pressure
LP	Low Pressure (also, Low Pressure side of a Differential Pressure Transmitter)
LRL	Lower Range Limit
LRV	Lower Range Value
mAdc	Milliamperes Direct Current
mmHg	Millimeters of Mercury
mV	Millivolts
Nm	Newton·meters
NPT	National Pipe Thread
NVM	Non-Volatile Memory
Pa	Measured static pressure in PV4 algorithm
Pc	Absolute critical pressure of the gas
Pd	Static pressure at downstream point
Pdp	Measured differential pressure in Pascals in PV4 algorithm
Pf	Absolute pressure of flowing gas
Pr	Reduced pressure
Pu	Static pressure at upstream point
PM	Process Manger
PSI	Pounds per Square Inch
PSIA	Pounds per Square Inch Absolute
PV	Process Variable
PWA	Printed Wiring Assembly
RFI	Radio Frequency Interference
RTD	Resistance Temperature Detector
SFC	Smart Field Communicator
STIM	Pressure Transmitter Interface Module
STIMV IOP	Pressure Transmitter Interface Multivariable Input/Output Processor
T/C	Thermocouple
URL	Upper Range Limit
URV	Upper Range Value
US	Universal Station
Vac	Volts Alternating Current
Vdc	Volts Direct Current

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